2. PROCESS DESCRIPTION

The following sections provide descriptions of the proposed Copper World Project.

2.1 Copper World Project

2.1.1 General Process Description

Major operations associated with the Copper World Project include: (a) open-pit mining from six (6) pit areas that will include drilling, blasting, loading, stockpiling, and hauling of sulfide and oxide ore and development rock (waste rock); (b) primary crushing and stockpiling of sulfide and oxide crushed ore; (c) stockpile reclaim; (d) milling and flotation of sulfide ore; (e) heap leaching of oxide ore; (f) tailings thickening and placement in a "conventional" storage facility; (g) concentrate leaching and precious metals recovery; (h) optional copper concentrate dewatering and preparation for shipment; (i) moly concentrate drying and bagging, (j) solvent extraction and electro-winning (SX-EW) and copper cathode production from copper concentrate and oxide leach circuits; and (k) a sulfuric acid plant.

Secondary processes include: (a) fuel burning equipment; (b) reagent systems; (c) storage tanks; (d) organic reagent use; (e) an analytical metallurgical laboratory; and (f) the use of mobile support vehicles.

The production schedule was developed from detailed mining sequence plans. The mine sequencing provides detailed information through year 15. The annual maximum mining rate for Sulfide Ore is 21.9 million tons per year (M TPY) starting in Year 5 and continuing until the end of Year 14. The maximum annual movement of waste rock is 51.1M TPY which occurs in Year 10. Additionally, the mining and hauling of oxide ore peaks in Years 6-8 at 16.425M TPY. Although ore and waste rock quantities vary annually, the primary contributor to offsite emissions impacts is directly linked to the distance traveled by the mine vehicle fleet. The vehicle miles traveled (VMTs) for the mine fleet increase to a maximum rate in Year 14 of the mine life. As a result, this year represents the maximum mine emissions profile and maximum potential for adverse ambient impacts.

Although Year 14 represents the maximum potential for overall ambient impacts, it also represents a larger geographic area of operational development. As a result, two secondary assessments of impacts were generated for reviewing impacts of the Project.

The first focused on the mining activities during the first five years of the development of the Project. Although annual mining rates would be lower during this time frame, operations would be geographically constrained to multiple pits on the west and central portions of the mine property. Based on a review of the geographic location of proposed mine activities, as well as the maximum mining rates, it was determined that Year 2 would represent the maximum potential for impacts during the early mine development period.

The second focused on the period with maximum material mining and hauling rates. Although this period includes shorter haul distances and therefore less vehicle roadway emissions, it would include higher mining rates. Based on a review of the geographic location of proposed mine activities, as well as the maximum mining rates, it was determined that Year 8 would represent the maximum potential for impacts during the period of maximum material mining and hauling.

During all periods of the mine development, mining of the ore will occur via conventional open-pit mining techniques including drilling, blasting, loading and hauling. Waste rock will be transported by haul trucks for placement in waste rock storage areas (termed waste rock facility, or WRF). Under normal operations, upon arrival at the processing plant area (Plant Site), sulfide ore will be crushed and transferred via conveyor to the mill for further processing. Oxide ore will either be placed directly on the heap leach pad (HLP) or will be crushed and conveyed to the HLP. Stockpiling of sulfide ore at the processing plant is also contemplated during periods of processing plant downtime or to ensure adequate supply of ore to the processing plant during hauling disruptions.

The molybdenum concentrate from the milling and flotation operation will be shipped off site for further processing. The copper concentrate will be processed onsite in a concentrate leach circuit, with the recovery of copper occurring in a Solvent Extraction and Electrowinning (SX-EW) plant. However, modeling has also assumed conventional handling (dewatering and shipment) of copper concentrate.

General process flow diagrams for these processes are presented in **Appendix C**.

Descriptions of the major processes, related potential air pollutant emissions from the processes, and the methods that will be used to control emissions, are discussed below. In addition, a plan view map of the facility showing the process locations is presented in the revised modeling report in **Appendix B**.

The processes at the Copper World Project have the potential to produce air pollutant emissions including: total suspended particulate matter (TSP), particulate matter (PM), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOCs), sulfuric acid (H_2SO_4), hazardous air pollutants (HAPs), and greenhouse gases (GHGs). GHGs include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

2.1.2 Open Pit Mining

Open pit mining will be conducted using large-scale equipment including rotary blasthole drills (diesel), a hydraulic percussion track drill, hydraulic mining shovels, front end loaders, off-highway haul trucks, crawler dozers, rubber-tired dozers, motor graders and off-highway water trucks. Open pit mining is scheduled for 24 hours per day, 7 days per week, and 365 days per year. The maximum annual mining rates are expected to reach about 27.4 million tons of ore and waste in Year 2, 73 million tons of ore and waste in Year 8, and 68.5 million tons of ore and waste in Year 14. This results in average daily mining rates of approximately 75 thousand tpd of total material mined (combined sulfide and oxide ore and waste rock) in Year 2, 200 thousand tons per day (tpd) of total material mined (combined sulfide and oxide ore and waste rock) in Year 8, and 187.7 thousand tons per day (tpd) of total material mined (sulfide ore and waste rock) in Year 14.

Peak mining rates are presented in this application to allow maximum production flexibility. It is not anticipated that all peak rates can be achieved simultaneously, and rates will naturally fluctuate with time. Emissions from mining operations are dependent primarily upon the mining rate and haul truck travel, with haul truck travel (vehicle miles traveled, VMTs) representing approximately 40% of total particulate related emissions.

The highest projected haul truck travel will occur in Year 14 (about 68.5 million tons of ore and waste per year; 2.61 million haul truck VMTs). By comparison, the projected annual mining rate and haul truck travel for Year 8 are approximately 73 million tons of ore and waste and 2.246 million haul truck VMTs while for Year 2 the numbers are 27.4 million tons of ore and waste and 294.5 thousand haul truck VMTs, respectively. Ambient impacts from operations during all other years are anticipated to maintain lower ambient emissions impacts than during Years 2, 8, and 14.

Because ore and waste rock tonnage and haul mileage can offset each other, the stated haul truck VMTs for Year 14 is a conservative maximum. Ore and waste rock tonnage could increase from the average values but are offset by a haul distance decrease during a particular phase of operations. As a result, emissions would not be anticipated to increase even if short-term haul truck tonnages increased.

The emission information presented in the revised modeling report in **Appendix B** for the Copper World Project is based on operations during Year 2, Year 8, and Year 14.

2.1.3 Drilling and Blasting

Drilling and blasting are performed within the Rosemont open pit mine and the smaller mine pits (Peach, Elgin, Heavy Weight, Copper World and Broadtop Butte). The bulk of production blasthole drilling will be performed by rotary blasthole drills equipped with emissions controls, such as the use of shrouds and pre-watering the area. Ammonium nitrate and fuel oil (ANFO) blasting agents will be used for nearly all rock breakage in dry ground. Ammonium nitrate emulsions will be employed in wet conditions.

Drilling activity rates were developed for each modeled operational year based on the number of drills and the rate of drilling per day and per year. In general, the maximum drilling rates for each of the modeled operational years are summarized as follows:

- Year 2: 280 holes drilled per day and 49,000 holes drilled per year (total activity rate from combined activity in Peach, Elgin, Copper World and Heavy Weight pits);
- Year 8: 400 holes drilled per day and 46,000 holes drilled per year (total activity rate from combined activity in Broadtop Butte and Rosemont pits); and
- Year 14: 200 holes drilled per day and 30,000 holes drilled per year. (Rosemont Pit activity rate).

Drilling activity rates in other operational years are not anticipated to exceed the maximum total activity rates presented above; however, the activity rate from any single pit will fluctuate based on the operational year.

Many factors are considered when determining a blast pattern including material density, hole spacing, hole depth, ANFO charge rate and total area to be blasted. Based on the methodology for emissions calculation from blasting, the variables that limit blast emissions are the total horizontal area of the blast and the total amount of ANFO utilized. As a result, these values were developed based on the mine plan. In general, the maximum blasting rates for each of the modeled operational years are summarized as follows:

- Year 2: 253,684 ft^2 horizontal area blasted per day and 44,394,700 ft^2 horizontal area blasted per year. 84 tons ANFO use per hour and per day, 14,700 tons of ANFO use per year (total activity rate from combined activity in Peach, Elgin, Copper World, and Heavy Weight pits);
- Year 8: 543,606 ft^2 horizontal area blasted per day and 62,695,892 ft^2 horizontal area blasted per year. 120 tons ANFO use per hour and per day, 14,070 tons of ANFO use per year (total activity rate from combined activity in Broadtop Butte and Rosemont pits); and
- Year 14: 181,202 ft^2 horizontal area blasted per day and 54,360,600 ft^2 horizontal area blasted per year. 60 tons ANFO use per hour and per day, 18,000 tons of ANFO use per year (Rosemont Pit activity rate).

Blasting activity rates in other operational years are not anticipated to exceed the maximum total activity rates presented above; however, the activity rate from any single pit will fluctuate based on operational year.

2.1.4 Loading and Hauling

Ore and waste rock are loaded into haul trucks by shovels and loaders and hauled to their respective processing locations. Prior to loading, the material is watered to increase the moisture content of the material to control loading and subsequent unloading emissions. Both sulfide and oxide ore will be mined and processed. Sulfide ore will be transported from the open pits and either dumped directly into the sulfide primary crusher dump hopper or unloaded to the run of mine stockpile located close to the primary crusher. The sulfide ore will be crushed and stockpiled in an uncovered coarse ore stockpile prior to being processed by the mill. Oxide ore will be transported from the open pits and either dumped directly into the oxide primary crusher dump hopper or dumped directly onto a heap leach pad.

Temporary placement of ore materials in the run of mine stockpile is only anticipated during the startup phase and during times such as crusher maintenance or short-term operating disruptions.

Waste rock from the open pit will be transported to the main waste rock facility or to other waste rock storage areas such as the area underneath the heap leach pad. In Year 2, the waste rock from the Elgin Pit and a portion of the waste rock from the Peach Pit will be used to construct the haul roads associated with the Copper World Pit prior to commencement of mining operations in the Copper World Pit.

Loading and hauling throughputs for Year 2, Year 8, and Year 14 reflect operations in those respective years' potential to emit (PTE). It should be noted that oxide ore mining operations cease well before Year 14. These emissions have been included in the emissions estimates for the Year 2 and Year 8 modeling impact assessments but are not included in the Year 14 modeling impact assessment.

Loading ore and waste rock into the haul trucks from the open pit mine has the potential to emit TSP, PM, PM_{10}, and $PM_{2.5}$ emissions. Additionally, using haul trucks to transport the ore and waste rock creates fugitive particulate emissions from the unpaved haul roads.

Fugitive particulate emissions from haul roads and unpaved, regularly traveled access roads are proposed to be controlled by watering or chemical surfactant. The application of control was designed to ensure 90% minimum control on all onsite roadways including all processing plant roads and the heavy haul road network. Enhanced controls were further designed for sections of the heavy haul road network in close proximity to the ambient air boundary with increased potential for offsite impacts. These enhanced controls were designed to achieve a minimum control efficiency of 95%. The exact extent of the road network proposed for 95% control is detailed in the revised modeling report in **Appendix B** and the associated dispersion modeling files.

2.1.5 Primary Crushing and Coarse Ore Stockpile

A temporary ore stockpile, located near the primary crusher, will be used to provide flexibility in handling short-term operating disruptions in the crushing and conveying system (it will no longer be in use by Year 14). Only a small portion of the mined sulfide ore will need to be stockpiled prior to primary crushing. The majority of the sulfide ore will be dumped directly into the primary crusher dump hopper. For the sulfide ore that is stockpiled, it will be transported via loader or haul truck to the crusher dump pocket.

Similar to sulfide ore, a small amount of mined oxide ore may also need to be stockpiled. This would primarily occur during the early mine life operations (oxide ore mining operations cease prior to Year 14). During operations, oxide ore will either dumped directly into the primary crusher dump hopper and crushed or placed directly on the heap leach pad. As currently estimated, about 70% of the oxide ore would be crushed. The remaining run of mine material would be dumped directly on the heap. Emissions from the temporary ore stockpile would be controlled through the use of as needed water sprays.

There are two primary crushers and coarse ore stockpiles planned: one for sulfide ore and one for oxide ore, though the oxide crusher and coarse ore stockpile will only be used prior to Year 10 of the mine life. The transition from both oxide and sulfide ore to just sulfide is detailed in the mine planning values in **Appendix B** in support of the facility dispersion modeling.

The sulfide crusher dump hopper will directly feed the sulfide primary crusher. Primary crushed sulfide ore will be withdrawn from the crusher discharge vault by a crusher discharge conveyor. The conveyor will discharge to the stockpile feed conveyor belt that discharges to the sulfide coarse ore stockpile. Emissions created by the unloading of sulfide ore to the dump pocket are controlled by a dry fogging system. The primary crusher and transfers to the crusher vault, discharge feeder and stockpile feed conveyor are controlled by the Sulfide Primary Crusher Cartridge Dust Collector. The sulfide coarse ore stockpile is not enclosed; however, emissions from the stockpile will be controlled through as needed watering of the stockpile and water spray on the material entering the pile. A process flow diagram of the sulfide primary crushing and coarse ore stockpiling process is presented in **Appendix C.**

The oxide crusher dump hopper will directly feed the oxide primary crusher. Primary crushed oxide ore will be withdrawn from the crusher discharge vault by a crusher discharge conveyor. The crusher discharge conveyor will discharge to the stockpile feed conveyor belt that discharges to the oxide coarse ore stockpile. Emissions created by the unloading of oxide ore to the dump pocket are controlled by a dry fogging system. The primary crusher and transfers to the crusher vault, discharge feeder and stockpile feed conveyor are controlled by the Oxide Primary Crusher Cartridge Dust Collector. The oxide coarse ore stockpile is not enclosed; however, emissions from the stockpile will be controlled through as needed watering of the stockpile and water spray on the material entering the pile. A process flow diagram of the oxide primary crushing and coarse ore stockpiling process is presented in **Appendix C.**

Throughputs associated with the crushing system reflect operations in Year 2, Year 8, and Year 14. Note: Oxide ore mining operations cease prior to Year 14.

The temporary ore stockpile, material transfer to the primary crusher, primary crushing, and material transfers from the primary crusher to the coarse ore stockpiles have the potential to emit TSP, PM, PM_{10}, and $PM_{2.5}$ emissions.

2.1.6 Coarse Ore Stockpile Reclaim

Primary crushed sulfide ore will be stockpiled in an open sulfide coarse ore stockpile. The stockpile will sit directly on the ground and a reclaim tunnel will be installed beneath the stockpile. Sulfide ore will be withdrawn from the coarse ore stockpile by apron feeders installed in the reclaim tunnel. The feeders will discharge to a conveyor belt which will discharge to a SAG mill. A process flow diagram of the stockpile reclaim and transfer to the SAG mill process is presented in **Appendix C**.

The SAG mills will each operate in closed circuit with a pebble feeder and a pebble crusher. Rock pebbles will be transported by conveyor to the pebble crusher bin and then into the pebble crusher feeder and pebble crusher, where it will be processed and returned by belt conveyors to the SAG mill. A process flow diagram of the pebble crusher process is presented in **Appendix C**.

The material transfer points from the reclaim feeders to the SAG mill have the potential to emit TSP, PM, PM_{10}, and $PM_{2.5}$ emissions. Particulate matter emissions due to material transfers from the sulfide coarse ore stockpile to the reclaim feeders and from the reclaim feeders to the SAG mill conveyor are controlled by the Reclaim Tunnel Line and Pebble Crusher Line Dust Collector. The transfer from the SAG mill feed conveyor to the SAG mill will be controlled with water addition; therefore, this part of the process is not a source of particulate emissions.

The material transfer points from the SAG mill to the sulfide pebble crusher feed bin and all material transfer points upstream of the pebble crusher will be controlled with water addition; therefore, this part of the process is not a source of particulate emissions. Particulate matter emissions from the material transfer points from the pebble crusher through to the SAG mill feed conveyor are controlled by the Sulfide Reclaim Tunnel and Pebble Crusher Cartridge Dust Collector.

Primary crushed oxide ore will be stockpiled in an open coarse ore stockpile. The stockpile will sit directly on the ground and a reclaim tunnel will be installed beneath the stockpile. Oxide ore will be withdrawn from the coarse ore stockpile by apron feeders installed in the reclaim tunnel. The feeders will discharge to a conveyor belt which will discharge to a secondary feeder screen. Oversized materials will discharge to a secondary crusher. Material from the feeder screen and the secondary crusher will discharge to a discharge conveyor feeding an Agglomerator. Agglomerated oxide ore would then be conveyed to the heap leach pad. A process flow diagram of the stockpile reclaim and transfer to the secondary crusher process is presented in **Appendix C**.

The material transfer points from the reclaim feeders to the Agglomerator have the potential to emit TSP, PM, PM_{10}, and $PM_{2.5}$ emissions. Particulate matter emissions due to material transfers from the oxide coarse ore stockpile to the reclaim feeders and from the reclaim feeders to the Secondary Crusher Discharge Conveyor are controlled by the Secondary Crusher Dust Collector. The transfer from the Secondary Crusher Discharge Conveyor to the Agglomerator will be controlled with water addition; therefore, this part of the process is not a source of particulate emissions.

Throughputs associated with the stockpile reclaim system reflect operations in Year 2, Year 8, and Year 14. Note: Oxide ore mining operations cease prior to Year 14.

2.1.7 Milling and Flotation

Sulfide ore will be ground with water to the final product size in a SAG and ball mill grinding circuit. The SAG mill will operate in a closed circuit with a trommel screen, pebble feeder, and a pebble crusher. Trommel screen oversize (rock pebbles) will be transported by belt conveyor to the pebble crusher bin and then into the pebble crusher feeder and pebble crusher, where it will be processed and returned by belt conveyor to the SAG mill. Trommel undersize will be the final product from the SAG circuit and will report to the ball mills for additional grinding. Flotation follows processing by the ball mills to produce the copper and molybdenum mineral concentrate slurries, which are transported to the copper and molybdenum dewatering circuits, respectively. Process flow diagrams of the milling and flotation processes are presented in **Appendix C**.

Except for the pebble crushing process, all material processed by the SAG mill grinding circuit and the flotation circuit contains a sufficient amount of moisture such that no potential particulate emissions are formed. In the SAG mill, the added moisture causes fine particles in the crushed ore to agglomerate. Therefore, there will be no emissions due to milling, screening, or material transfer.

As material sits in the pebble crusher, the ore may start to dry out. Therefore, the material transfer points from the pebble crushing process and the material transfer points (after pebble crushing) have the potential to emit TSP, PM, PM_{10}, and $PM_{2.5}$ emissions. These emissions will be controlled by the Sulfide Reclaim Tunnel Line and Pebble Crusher Cartridge Dust Collector.

Throughputs associated with the sulfide ore milling and flotation process reflect operations in Year 2, Year 8, and Year 14.

2.1.8 Copper Concentrate and Molybdenum Concentrate Dewatering/Shipment

The Copper World Project will primarily employ concentrate leach technology to eliminate the need for offsite shipping of copper concentrate. However, a conventional copper concentrate filtering and shipment process is included in this application to allow for the use of either process on a dynamic basis.

Copper concentrate slurry will be dewatered and thickened in a copper concentrate thickener. Thickener underflow (thickened mineral slurry) will be pumped to copper concentrate filters. Filter cake will be transferred to the copper concentrate stockpile located in the copper concentrate loadout building. Copper concentrate will be reclaimed by front-end loaders and placed in trucks or containers for shipment to market. A process flow diagram of the copper concentrate dewatering process is presented in **Appendix C**.

The copper concentrate dewatering operation will produce a final product with an approximate moisture content of 10%. TSP, PM, PM_{10}, and $PM_{2.5}$ emissions have the potential to be released during material transfer points following processing by the filters where the moisture content is reduced. HAP potential (As, Cd, and Pb) in the copper concentrate is low as all concentrations are <0.1% with the concentrate produced. The copper concentrate stockpile is enclosed in a building to prevent the release of windblown fugitives. Emissions from the building will be controlled by the Copper Concentrate Building Dust Collector.

The molybdenum concentrate slurry stored in the molybdenum filter feed tank will be pumped to a molybdenum concentrate plate and frame filter. Molybdenum filter cake will then discharge to a dryer. The dried concentrate will be placed in a concentrate storage bin and then transferred to the molybdenum concentrate bag feeder and placed into the bag loader. The molybdenum concentrate supersacks will be loaded onto trucks for shipment to market. A process flow diagram of the molybdenum concentrate dewatering process is presented in **Appendix C**.

The molybdenum concentrate dewatering operation will produce molybdenum concentrate with an approximate moisture content of 10% to 12%. Material transfer points, subsequent to processing by the plate and frame filter, have the potential to emit TSP, PM, PM_{10}, and $PM_{2.5}$ emissions. The dried molybdenum concentrate material transfer to the molybdenum concentrate bin will be controlled by the Molybdenum Concentrate Storage Bin Dust Collector. Emissions from the bag loading process will be controlled by the Molybdenum Bag Loader Dust Collector. Additionally, the molybdenum drying operation has the potential to produce TSP, PM, PM_{10}, and $PM_{2.5}$ emissions. These emissions will be controlled by the molybdenum dryer scrubber.

Throughputs associated with the copper concentration and molybdenum dewatering systems reflect operations in Year 2, Year 8, and Year 14.

2.1.9 Oxide Ore Leaching

The leaching of both run of mine (ROM) and crushed and agglomerated oxide ore is anticipated in this application for the Copper World Project. The crushing and placement of the agglomerated oxide ore on the heap leach pad is described in **Section 2.1.6** above. **Sections 2.1.4 and 2.1.5** above describe the mining and hauling of oxide ore to the heap leach pad.

Oxide ore is placed on the heap leach pad in 20 to 30-foot lifts. Irrigation is provided by a drip emitter-type irrigation system designed to deliver 0.002 gph/ft^2 of a mild sulfuric acid solution. Cells are placed under irrigation for a period of approximately 120 days. Pregnant leach solution (PLS) is collected from each heap cell by a series of drainpipes at the bottom of the heap that ultimately report (by gravity) to a PLS Pond.

The hauling and dumping of ROM oxide ore on the heap leach pad, as well as the management of the heap leach pad, has the potential to emit TSP, PM, PM_{10}, and $PM_{2.5}$ emissions. As discussed in previous sections, the heap leach pad activities will and will only be present in the first 10 years of the mine life. The leaching of crushed and agglomerated oxide ore on the heap leach pad is a wet process. The added moisture causes fine particles in the crushed ore to agglomerate such that no potential particulate emissions are formed.

2.1.10 Concentrate Leach and Precious Metal Recovery

The concentrate leach technology consists of two steps. The first is mechanical liberation, achieved by ultrafine grinding of the sulfide concentrate using IsaMill™ technology. The second step is chemical liberation, achieved by oxidation of the concentrate in a series of leach reactor tanks to extract copper into solution. Copper is then recovered from solution by the solvent extraction-electrowinning (SX-EW) process (see **Section 2.1.12** below).

The dewatered copper concentrate is pumped from the copper concentrate storage tank to a M7500 IsaMill™ where it is ground to 80% passing 12 microns. The milled concentrate is then pumped to the first of approximately eight leach reactors operating in serial configuration with a combined residence time of 48 hours, each with a live volume of 1760 m^3, where the concentrate is oxidized in an acidic oxidative leach solution to achieve a copper extraction of 98%. The concentrate leach plant has a design nominal capacity of 1,870 t/d.

Raffinate from the SX-EW plant is added to the oxidative leaching circuit with concentrated acid added as necessary to maintain an excess of about 10 g/L free acid in the output stream. Oxygen is injected into the oxidative leach reactors with the HyperSparge™ supersonic gas injectors to facilitate leaching. The oxidative leach discharge reports to sulfur flotation.

The discharge from the concentrate leach process is pumped to two Jameson Cells to recover sulfur from the residue. The sulfur concentrate is pumped to the sulfur concentrate thickener. The thickener underflow is pumped to a belt filter, which discharges via chute to the sulfur concentrate conveyor. The filtrate is returned to the thickener. The thickener overflow is pumped to the iron control circuit along with the sulfur flotation tails.

The sulfur concentrate is conveyed to the sulfur melting tank, where it is melted prior to being filtered. The heat required to melt the sulfur is provided as waste heat from the sulfur burner. The molten sulfur filtrate is transferred to molten sulfur storage tanks and the residue reports to the precious metal recovery circuit.

The sulfur flotation tails are pumped to the iron control/neutralization circuit together with the sulfur concentrate thickener overflow. Limestone is added and controlled pH precipitation is performed to remove iron, arsenic, and other deleterious dissolved elements from the leached slurry. Oxygen is injected into the neutralization reactors to convert ferrous iron to ferric prior to precipitation as goethite. The neutralization circuit consists of five reactors, each with a live volume of 400 m^3. The oxidized residue is pumped to a thickener. The thickener underflow is pumped to a belt filter which discharges via chute to the oxidized residue conveyor. The filtrate is combined with the thickener overflow and pumped to the PLS Pond where it is combined with PLS from the oxide heap and then transferred to the SX-EW circuit.

The oxidized residue from the neutralization circuit is combined with the sulfur filter residue and re-pulped prior to being fed to a lime boil to decompose any silver-jarosite which may have formed during the oxidation step. From the lime boil, the slurry reports to a cyanidation circuit to leach gold and silver. The pregnant liquor and leach residue flow to solid-liquid separation and washing carried out in a countercurrent decantation (CCD) circuit. The residue is sent to a cyanide destruction step prior to being sent to the tailings storage facility and the pregnant liquor to the Merrill-Crowe zinc cementation process.

From the CCD circuit, the solution is clarified using leaf filters pre-coated with diatomaceous earth. Dissolved oxygen is removed from the clarified solution by passing it through a vacuum de-aeration column. Zinc dust is added to the clarified, de-aerated solution which precipitates gold and silver. The gold and silver precipitates are filtered and smelted to a doré bar.

The process will consist of approximately six (6) tanks for the leach stage followed by five (5) thickeners for the counter current decantation. The tanks will be covered; in addition, there are no particulate or gaseous pollutant emissions anticipated to be associated with these tanks. The precious metal refinery will utilize an electric induction furnace; particulate emissions from the refinery and furnace will be controlled by the refinery dust collector.

2.1.11 Sulfuric Acid Plant

The acid plant is a double-contact double-absorption process. Molten sulfur is pumped from the molten sulfur storage tanks to a sulfur furnace where it is mixed with high pressure air to atomize the sulfur and dry combustion air to burn it. To remove any moisture in the air prior to combustion, it is drawn in from the atmosphere by the main blower through an air filter and drying tower. In the drying tower, moisture is removed through absorption in sulfuric acid. Off-gas, containing SO_2, is cooled by passing through a waste heat boiler. The SO_2 is then catalytically converted to SO_3 in a four-bed converter with vanadium pentoxide as the catalyst. Between each of the four converter beds, heat exchangers and economizers are used to regulate the temperature. After passing the first three converter beds, the hot SO_3 gas is cooled in a cold interpass exchanger and economizer before reaching the interpass adsorption tower, where it is absorbed into strong sulfuric acid. Outlet gas from the interpass tower is reheated using heat exchangers before entering the fourth converter bed, where the remaining SO_2 gas is converted to SO_3. The SO_3 gas feeds the final absorption tower to absorb the formed SO_3 into H_2SO_4. The acid plant has a production capacity of 1,130 tons/day of H_2SO_4.

Steam produced from cooling the sulfur burner is superheated and used to create electrical power in the steam turbine generator. Low-pressure steam used to start up the sulfur burner is generated by an electric start-up/emergency boiler. Some low-pressure steam is also extracted from the steam turbine engine to be used by the molten sulfur heating system during the acid-making process.

The sulfuric acid plant has the has the potential to emit TSP, PM, PM_{10}, and $PM_{2.5}$ emissions, H_2SO_4 and SO_2. Emissions of particulates and H_2SO_4 will be controlled by the acid plant scrubber. The sulfuric acid plant will be subject to 40 CFR Part 60 Subpart H, as discussed in **Section 5.1.1 and Appendix H**.

2.1.12 Solvent Extraction and Electrowinning

From the PLS Pond, PLS is pumped to the SX circuit to extract copper. The SX circuit consists of five (5) Dispersion Overflow Pump (DOP) tanks, five (5) DOP turbine tanks, ten (10) mixer tanks and five (5) extraction settlers. In the circuit, PLS flows counter-currently through the extraction cells where it is contacted with an organic solvent. Copper is transferred from the PLS to the organic phase. The barren raffinate flows to the Raffinate Pond and the loaded organic flows to the loaded organic tank. Loaded organic is then pumped to the wash stage where iron is scrubbed away to reduce electrolyte iron contamination. Washed loaded organic flows into the stripping stage, where it is stripped of copper by a high-acid aqueous phase (electrolyte) and recycled back to the extraction cells. The electrolyte is pumped through electrolyte filters to the tankhouse where the copper is plated on stainless steel cathodes in the electrowinning process. Cathodes are removed from the cells and transferred to a stripping machine. Stripped cathode blanks are returned to the electrowinning process and the copper cathodes are bundled and stacked for shipping.

The SX system has the potential to emit VOC and HAP emissions. The EW cells have the potential to emit H_2SO_4 and cobalt compounds. The H_2SO_4 and cobalt compound emissions will be controlled by the Electrowinning Plant Scrubbers.

2.1.13 Tailings Dewatering/Thickening and Placement

Tailings associated with the Copper World Project will be placed in conventional storage facilities and are therefore wet processes. Tailings slurry, with a density of about 65% solids by weight, will be pumped to the tailings storage facilities from the tailings thickeners. The tailings slurry will be cycloned at the crest of the tailings embankment. The heavier sand potions of the tailings will be used to build the embankments while the finer materials will flow to the inside of the impoundments. Decanted water will pond on the top surface of the tailings impoundment and will be pumped back into the process.

A Tailings Management Plan will be developed for the tailings storage facilities that outlines dust control measures during embankment construction, general operations, and high wind conditions.

The throughputs associated with tailings thickening and placement reflect operations in Year 2, Year 8 and Year 14.

With the exception of the wind erosion of the tailings storage area, the tailings management process is a completely wet process. Therefore, there are no emissions associated with the tailings management. Wind erosion of the tailings storage area has the potential to emit TSP, PM, PM_{10}, and $PM_{2.5}$ emissions.

2.1.14 Secondary Processes

The following secondary processes are necessary to support the operations at the Copper World Project and are capable of producing emissions: (a) fuel burning equipment; (b) reagent systems; (c) storage tanks; (d) organic reagent use; (e) acid leach; (f) an analytical, metallurgical laboratory; (g) the use of mobile vehicles; and (h) open burning.

There are four pieces of stationary fuel burning equipment that will be used at Copper World; three emergency generators used during commercial power outages, and one fire water pump used in emergency situations. The emergency generators will use diesel fuel and have output capacities of 1,345 kW each. The fire water pump is also diesel fired with an output capacity of 400 hp. Additionally, Rosemont uses multiple nonroad engines and on-road vehicles. Regulated air pollutants emitted from the diesel fuel burning equipment include TSP, PM, PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs, HAPs, and GHGs. The nonroad engines and on-road vehicles are not regulated by ADEQ.

Reagent systems include delivery of reagents to the facility, possible mixing and/or preparation of reagents, storage, and distribution to a process stream. Some of the reagents delivered to the facility are in solid form and will be mixed with water at the facility. Other reagents may be delivered in liquid form or may remain in solid form prior to use in the process. The material transfer points of the solid phase reagents have the potential to emit TSP, PM, PM_{10}, and $PM_{2.5}$ emissions. The liquid phase reagents stored in tanks prior to use may produce VOC and HAP emissions from breathing and working losses depending on the properties of the reagent.

Emissions from the reagent systems will be controlled by the Collector Storage and Distribution Tanks Stack and the Collector Area Ventilation Fan Stack. The transfer of lime to the lime storage bins is controlled by the Quicklime Dust Collector, emissions from the Lime Slaking Mill are controlled by the Lime Scrubber and the transfer of flocculant from the supersacks to the flocculant feed bin will be controlled by the Flocculant Feed Bin Cartridge Dust Collector. Process flow diagrams of the reagent systems are presented in **Appendix C**.

Copper World will include multiple storage tanks containing volatile organic liquids that are either greater than 10,000 gallons with a vapor pressure equal to or greater than gasoline, or greater than 40,000 gallons with a vapor pressure equal to or greater than diesel fuel. Emissions from such tanks will result in the form of breathing and working losses. Rosemont will have five tanks that meet these criteria. All other tanks that do not meet these criteria are considered insignificant activities.

Reagents are used in various processes at Copper World. Frothers, promoters, flocculants, and xanthates for copper and molybdenum promotion and collection are added during the bulk flotation and molybdenum flotation processes. Antiscalants and flocculants are added to the dewatering processes. The types of reagents and the quantities used may be modified to address the changes in ore and processing conditions. All VOC emissions from organic reagent use in the flotation and dewatering processes are fugitives and are negligible due to the dilution of the organic reagents in large quantities of water and the comparatively low vapor pressures of the organics when compared to water.

The analytical, metallurgical laboratory will be a single-story pre-engineered building and will consist of a sample preparation area, metallurgical laboratory, reagent storage area, and balance rooms. The sample preparation area will contain sample crushers, pulverizers, splitters, sieve shakers, blenders, and one dust collector (Laboratory Dust Collector) and one scrubber (Laboratory Scrubber) to capture and contain any particulate matter emissions generated from these operations. There are no other processes taking place in the metallurgical laboratory that will produce emissions.

The use of mobile vehicles is an integral part of operations at Copper World. The mobile vehicles include major mine equipment and mining support equipment. The mobile vehicles have the potential to produce particulate matter emissions from traveling on unpaved roads at the facility. The unpaved road emissions from the mobile vehicles are fugitive emissions and are controlled by road watering and/or chemical treatment as discussed in **Section 2.1.4** above.

Open burning may periodically need to be performed at the Project site. Any necessary open burn permits will be obtained prior to any open burning activities, and proper open burning procedures and requirements will be followed.

2.1.15 Insignificant Activities

Copper World is identifying insignificant activities at the Copper World Project facility. These are listed in **Appendix D**.

2.2 Alternate Operating Scenarios and Products

There are no alternate operating scenarios or products proposed. Minor changes in process unit configuration and processing chemicals are a routine part of the mining process in order to respond to the evolving ore characteristics and are not subject to alternate operating scenario treatment. These types of changes are encompassed within the estimated emission calculations presented in this application. Changes to the Copper World Project requiring notification or revisions will be properly addressed through the permitting process.

2.3 Material Balance

Material balance methods were used to calculate sulfur dioxide (SO_2) emissions from the combustion of diesel fuel by the emergency generators and fire water pumps. This method was further used to account for the combustion of diesel fuel as a component of ANFO for mine blasting activities. This method assumes that all of the sulfur contained in the fuel is converted to SO_2 and released to the atmosphere during combustion. Emission calculations are presented in **Appendix F**.

2.4 Dust Control Plan

A Dust Control Plan has been prepared for the Copper World Project. As such, Copper World is proposing to use a combination of Dust Control Programs A, B, C and D for fugitive dust control on the haul and other roads. These dust control programs are summarized below and detailed in the Dust Control Plan:

Dust Control Program A consists of the application of sufficient chemical suppressant to achieve a ground inventory of 0.25 gallons/yard^2 with a reapplication frequency of 1-month (where reapplication frequency refers to the time interval between applications used to maintain a specific ground inventory). The term "ground inventory" represents the residual accumulation of a dust suppressant from previous applications. Dust suppressants which could be used for this purpose include, among others, lignosulfonates, petroleum resins, asphalt emulsions and acrylic cement. For Program A, the control efficiencies mentioned in EPA referenced model (Fugitive Dust Background Document and Technical Information Documents for Best Available Control Measures) are averages and not maximums. As such, the use of a chemical dust suppressant with a ground inventory of 0.25 gallons/yd^2 could result in control efficiencies higher than 90%.

Dust Control Program B consists of periodic watering in sufficient amounts to achieve 90% control of PM_{10}. Program B will be applied only during days with precipitation of less than 0.01 inches. Different water application intensities necessary to achieve a 90% particulate control efficiency will be presented in the Dust Control Plan B for daytime and nighttime hours. The calculated water quantities required by the formula in Dust Control Program B will be compared to actual usage. Copper World will use these calculated numbers as a guideline. Should the updated fugitive dust control approach not be effective, resorting to the water application/consumption rates required by the EPA methodology equation will be the default position. Additionally, adjustments to the parameters used in the equation, such as evaporation, will be adjusted to site-specific conditions and not tied to conditions in Tucson, Arizona.

Dust Control Program C was designed to achieve 95% control on the heavy haul road network using a vendor specific dust control product when dust emitting operations are in closest proximity to the ambient air boundary. The exact extent of the road network proposed for 95% control is detailed in the revised modeling report in **Appendix B** and in the associated dispersion modeling files. A vendor specific dust control product is also planned for a portion of Santa Rita Road that is located within the Copper World private land boundary (see Dust Control Program D in the Dust Control Plan). Dust Control Program D was also designed to achieve 95% control.

Details of these programs are provided in the Dust Control Plan.

4. EMISSIONS OF REGULATED AIR POLLUTANTS

The emissions of regulated air pollutants, resulting of the proposed Project, involves the following pollutants:

- Particulate matter (PM/$PM_{2.5}$/PM_{10});
- Nitrogen oxides (NO_x);
- Carbon monoxide (CO);
- Sulphur dioxide (SO_2);
- Volatile organic compounds (VOCs);
- Hazardous Air Pollutants (HAPs); and
- Greenhouse gases (GHGs).

Detailed emissions calculations are included in **Appendix F** along with information regarding the development of the emission factors, throughputs and controls used to develop the emissions estimates. Additional information on the calculation methodologies is presented in the sections below.

4.1 Emission Calculations

4.1.1 Mining

4.1.1.1 Drilling (Unit ID: MN01)

Process Rate

Drilling activity rates were developed for each modeled operational year based on the number of drills and the rate of drilling per day and per year. The maximum drilling rates for each of the modeled operational years are summarized as follows:

- Year 2: 280 holes drilled per day and 49,000 holes drilled per year (total activity rate from combined activity in Peach, Elgin, Copper World and Heavy Weight pits);
- Year 8: 400 holes drilled per day and 46,000 holes drilled per year (total activity rate from combined activity in Broadtop Butte and Rosemont pits); and
- Year 14: 200 holes drilled per day and 30,000 holes drilled per year. (Rosemont Pit activity rate). (see **Appendix F**).

Drilling activity rates in other operational years are not anticipated to exceed the maximum total activity rates presented above; however, the activity rate from any single pit will fluctuate based on operational year.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from drilling are calculated using the emission factor of 1.3 lb/hole, from AP-42, Table 11.9-4 (10/98) for total suspended particulates (TSP) from drilling of overburden at western surface coal mines. The TSP emission factor is assumed to be applicable for PM. PM_{10} and $PM_{2.5}$ emissions from drilling are not listed in Table 11.9-4. PM_{10} emissions are assumed equal to 33% of PM emissions based on the ratio of PM_{10} to PM emissions for tertiary crushing of high moisture ore in AP-42, Table 11.24-2 (08/82).

$PM_{2.5}$ emissions are estimated to be 18.5% of PM_{10} emissions based on the ratio of $PM_{2.5}$ to PM_{10} controlled emissions for tertiary crushing in AP-42, Table 11.19.2-2 (08/04). This is higher than the actual value because pollution control devices have a lower efficiency for smaller size particulates.

Control Efficiency
Based on Year 2, Year 8, and Year 14 mine planning, control strategies for drilling emissions associated with blasthole drilling will be utilized. For production drilling operations in all pits, the drills will be equipped with drilling shrouds and a dry fogging particulate suppression system designed to reduce drilling particulate emissions by 95%.

4.1.1.2 Blasting (MN02)

Process Rate
Many factors are considered when determining a blast pattern including material density, hole spacing, hole depth, ANFO charge rate and total area to be blasted. Based on the methodology for emissions calculation from blasting, the variables that limit blast emissions are the total horizontal area of the blast and the total amount of ANFO utilized. As a result, these values were developed, based on mine planning. In general, the maximum blasting rates for each of the modeled operational years are summarized as follows:

- Year 2: 253,684 ft^2 horizontal area blasted per day and 44,394,700 ft^2 horizontal area blasted per year. 84 tons ANFO use per hour and per day, 14,700 tons of ANFO use per year (total activity rate from combined activity in Peach, Elgin, Copper World and Heavy Weight pits);
- Year 8: 543,606 ft^2 horizontal area blasted per day and 62,695,892 ft^2 horizontal area blasted per year. 120 tons ANFO use per hour and per day, 14,070 tons of ANFO use per year (total activity rate from combined activity in Broadtop Butte and Rosemont pits); and
- Year 14: 181,202 ft^2 horizontal area blasted per day and 54,360,600 ft^2 horizontal area blasted per year. 60 tons ANFO use per hour and per day, 18,000 tons of ANFO use per year (Rosemont Pit activity rate).

Blasting activity rates in other operational years are not anticipated to exceed the maximum total activity rates presented above; however, the activity rate from any single pit will fluctuate based on operational year. These values were used to limited emissions generation for the Copper World Project and are included in the emissions inventories in **Appendix F**.

Emission Factor
Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from blasting are calculated using the emission factor expression from AP-42, Table 11.9-1 (10/98) for blasting at western surface coal mines (Equation 1):

(Equation 1):

$$EF = (k)(0.000014)(A)^{1.5}$$

where:

EF	=	emission factor (lb/blast)
K	=	scaling factor (1 for TSP, assumed to be equivalent to PM, 0.52 for PM_{10}, 0.03 for $PM_{2.5}$)
A	=	horizontal area of the blast (ft^2; varies by year, calculated by multiplying the average amount of holes drilled per blast (varies by year) by the approximate spacing (30 ft) and burden (30 ft) of the drilling pattern)

Uncontrolled CO emissions from blasting are calculated using the emission factors from AP-42, Table 13.3-1 (02/80) for the detonation of ANFO. Uncontrolled SO_2 emissions are calculated using a mass balance based on a diesel fuel sulfur content of 0.0015% by weight (15 ppm ULSD) and diesel fuel to ANFO ratio of 6%. Uncontrolled NO_x emissions are calculated using the emission factor found in "NO_x Emissions from Blasting

Operations in Open-Cut Coal Mining" by Moetaz I. Attalla, Stuart J. Day, Tony Lange, William Lilley, and Scott Morgan (2008) (0.9 kg per metric ton based on reported average on page 7881 of the reference).

Uncontrolled CO_2, CH_4, and N_2O emissions are calculated using the emission factors of 73.96 kg/MMBtu, $3*10^{-3}$ kg/MMBtu, and $6*10^{-4}$ kg/MMBtu, respectively, from 40 CFR 98, Tables C-1 and C- 2 for distillate fuel oil No. 2. A diesel fuel oil to ammonium nitrate ratio of 6% and a diesel heating value of 19,300 Btu/pound of diesel fuel were used to express the CO_2, CH_4, and N_2O emission factors in terms of lb/ton of ANFO.

The gaseous emission factors for blasting are presented in the emissions inventory in **Appendix F**.

Control Efficiency

Besides good operating practices, other pollution control methods cannot be implemented during blasting.

4.1.1.3 Loading Ore and Waste Rock (Unit IDs: MN03, MN04, and MN05)

Process Rate

The annual process rates for loading ore (destined for crusher), ROM ore (destined for HLP), and waste rock into haul trucks are equal to the annual ore and waste rock mining rates at the Copper World Project. The mining rates (see **Appendix F**) are based on geologic and pit development studies completed at the Copper World Project and presented in the mine plan of operations. The average daily process rates for loading ore and waste rock in Years 2, 8 and 14 in the life of the mine are calculated by dividing the annual loading rates by 365, the quantity of days per year when mining will be performed. The hourly process rates for loading ore and waste rock are calculated by dividing the daily loading rates by 24 hours/day.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from loading ore (destined for crusher), ROM ore (destined for HLP), and waste rock into haul trucks are calculated using the emission factor expression from AP-42, Section 13.2.4.3 (11/06) for aggregate drop processes. This expression (Equation 2) is:

$$EF = (k)(0.0032)\frac{(\frac{U}{5})^{1.3}}{(\frac{M}{2})^{1.4}} \quad (2)$$

where:

EF	=	emission factor (lb/ton)
k	=	particle size multiplier (0.74 for PM_{30} (assumed to be equivalent to PM), 0.35 for PM_{10}, 0.053 for $PM_{2.5}$)
U	=	mean wind speed (The mean wind speed in the pits is 4.10 mph, 2/3 of the ambient mean wind speed of 6.15 mph to account for pit depth influence)
M	=	material moisture content (3.5% for ore (destined for crusher), ROM ore (destined for HLP), and waste rock from the mine as determined by

Control Efficiency

[1] 3.5% moisture represents a conservative minimum moisture content for water balance purposes, consistent with the Copper World Project's Aquifer Protection Permit (APP) application.

Watering of the bench and mine face will be implemented after blasting and prior to loading activities. As a result, an average control efficiency of 75% was utilized.

4.1.1.4 Hauling Oreand Waste Rock (Unit IDs: MN06, MN07, and MN08)

Process Rate

The annual, daily, and hourly process rates for the amount of vehicle miles traveled (VMT) by the haul trucks in order to haul sulfide ore to the primary crusher/temporary ore stockpile, leach ore to the leach pad, and waste rock to the waste rock storage area are calculated by multiplying the distance traveled (i.e. the distance from the mining location in the pit(s) to the primary crusher dump hopper/run of mine stockpile, leach pad, or waste rock storage area) by the amount of truckloads needed to haul the material. The number of truckloads is determined by dividing the anticipated annual, daily, or hourly amount of material mined by the average haul truck load (255 tons) and multiplying this number by two to account for the haul trucks returning empty to the mining location. For out of pit ore and waste rock hauling, the emissions are calculated utilizing the out of pit haul route length based on the calculated haul route as depicted within the AERMOD mine layout for each modeled mine year. This calculation is included in the emissions inventory for review by ADEQ. The emissions inventories calculate the VMT and resultant haul road surface emissions based on the haul road length multiplied by the number of trucks that travel the route in a given time period (1-hr, 24-hr and Annually). The truck trips are based on the amount of material movement on that route divided by the truck capacity and the size of the haul truck fleet allocated to that route. .

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions resulting from the use of haul trucks on unpaved roads at the Copper World Project are calculated from the emission factor expression (Equation 3a) in AP-42, Section 13.2.2 (11/06):

$$EF = (k)(\frac{s}{12})^a(\frac{W}{3})^b \qquad (3a)$$

where:

EF = emission factor (lb/VMT)

k = particle size multiplier (4.9 lb/VMT for PM_{30}, assumed to be equivalent to total suspended particulate matter and PM, 1.5 lb/VMT for PM_{10}, 0.15 lb/VMT for $PM_{2.5}$)

a = constant (0.7 for PM, 0.9 for PM_{10} and $PM_{2.5}$)

b = constant (0.45 for PM, PM_{10}, and $PM_{2.5}$)

s = surface material silt content (5.0%, a value consistent with recently permitted copper mines)

W = mean vehicle weight (294 tons, calculated by averaging the empty weight of the haul trucks [167 tons] and the loaded weight of the haul trucks [422 tons])

The emission factor for annual emissions is modified by the following precipitation factor to account for days when the roads are wet, and emissions are reduced:

$$EF_{annual} = (EF)(\frac{365-p}{365}) \quad (3b)$$

where:

EF_{annual} emission factor used to estimate annual emissions of particulate matter (lb/VMT)

EF = emission factor used to estimate hourly and daily emissions of particulate matter (lb/VMT, calculated by Equation 3a)

P = number of days per year with greater than 0.01 inch of precipitation (61 days/year, average data from 1950 – 2008 from the Western Region Climate Center, Santa Rita Experimental Range weather station located 8 miles southwest of the Copper World Project at 4,300 feet above mean sea level)

Control Efficiency

Emissions of particulate matter resulting from haul truck traffic on haul roads at the Copper World Project will be controlled by the application of water and/or chemical dust suppressant to the road surface. Additional details on haul road control efficiency are presented in **Section 2.4** above.

4.1.1.5 Unloading

This section covers unloading operations such as sulfide ore to the crusher or stockpile, leach ore to the crusher, stockpile or heap, and waste rock to the waste rock facility (WRF). Unit IDs covered include: MN09, MN10, and MN11.

Process Rate

The annual, maximum daily, and hourly process rates for unloading ore to the crusher stockpile, leach ore to the leach pad and waste rock to the waste rock storage area are equal to the leach ore and waste rock loading rates.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from unloading leach ore to the leach pad, sulfide ore to the crusher stockpile, and waste rock to the storage area are calculated using Equation 2 in **Section 4.1.1.3**. The material moisture content (M, 3.5%) is the material moisture content of the ore as determined by Rosemont. The mean wind speed (7.92 mph) is the average wind speed out of the pit based on 2016-2020 Tucson AERMET data. Since the unloading process at the Copper World Project is unprotected from the wind, the unaltered wind speed is used in the emission factor equation presented in Equation 2.

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented while unloading sulfide ore to the crusher stockpile (or crusher), leach ore to the leach pad (or stockpile or crusher), and waste rock to the waste rock facility area (WRF). However, as described in **Section 4.1.1.3** above, the bench and face of the mine will be controlled by intensive watering during loading. A portion of this moisture is expected to be retained on the material and will provide control during unloading. The moisture content of the unloaded material is anticipated to exceed 6%. As a result, a conservative average control efficiency of 45% was utilized.

4.1.1.6 Bulldozer Use (Unit ID: MN12)

Process Rate

The daily process rates for bulldozer use are calculated by multiplying each type of the bulldozer's daily utilization rate, as determined by the mine plan (see **Appendix F**), multiplied by 24 hours/day. The maximum annual process rates are calculated by multiplying the daily hours by 365, the quantity of days per year the bulldozers will be used. The hourly process rates are calculated by dividing the maximum daily process rates by 24 hours/day.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from bulldozing operations are calculated from the emission factor expression in AP-42, Table 11.9-1 (10/98) for the bulldozing of overburden at western surface coal mines. This expression (Equation 4) is:

$$EF = (k)(\frac{s^a}{M^b}) \quad (4)$$

where:

EF	=	emission factor (lb/hr)
k	=	particle size multiplier (5.7 for TSP assumed to be equivalent to PM, 0.75 for PM_{10}, 0.60 for $PM_{2.5}$ (5.7*0.105))
s	=	material silt content (bulldozing operations primarily represent handling of waste rock and ore with a bulldozer. The silt content of these materials is uncertain. AP-42, Table 13.2.4-1 (11/06) provides the silt content of various materials. The silt content of overburden in this table is 7.5% and was assumed for the silt content of the material handled by bulldozers.)
M	=	material moisture content (3.5% for sulfide ore, leach ore, and waste rock from the mine as determined by Rosemont)
a	=	constant (1.2 for PM and $PM_{2.5}$, 1.5 for PM_{10})
b	=	constant (1.3 for PM and $PM_{2.5}$, 1.4 for PM_{10})

Control Efficiency

Watering will immediately proceed ahead of the use of bulldozers. As a result, an average control efficiency of 75% was utilized.

4.1.1.7 Water Truck Use (Unit ID: MN13)

Process Rate

The annual, daily, and hourly process rates for water truck use were provided by Rosemont based on anticipated needs for each mine plan year.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions resulting from the use of water trucks on unpaved roads at the Copper World Project are calculated using Equations 3a and 3b. The surface material silt content (s, 5.0%) and number of days per year with greater than 0.01 inches of precipitation (p, 61 days/year) are equal to the values used to calculate the emission factor in **Section 4.1.1.4** above. Explanations for how these values are determined are presented in **Section 4.1.1.4** above.

The mean vehicle weight (W, 186.5 tons) is calculated by averaging the empty (125 tons) and loaded weights (248 tons) of the water trucks.

Control Efficiency
Emissions of particulate matter resulting from water truck use on haul roads at the Copper World Project will be controlled by the application of water and/or chemical dust suppressant to the road surface. Additional details on haul road control efficiency are presented in **Section 2.4** above.

4.1.1.8 Grader Use (Unit ID: MN14)

Process Rate
The daily process rates for grader use are calculated by summing the daily amounts of VMT for the grader. The VMTs are calculated by multiplying the hours of operation for the graders, as determined by the mine plan of operations (see **Appendix F**) by the average speed the graders will be traveling (1.0 mph). The maximum annual amounts of VMT by the graders are calculated by multiplying the daily VMT by 365, the quantity of days per year graders will be used. The hourly process rates are calculated by dividing the daily grader usage rates by 24 hours/day.

Emission Factor
Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from grader use are calculated from the emission factor expression in AP-42, Table 11.9-1 (10/98) for grading at western surface coal mines. This expression (Equation 5) is:

$$EF = (k)(a)(S)^b \quad (5)$$

where:

EF = emission factor (lb/VMT)

k = particle size multiplier (1 for TSP assumed to be equivalent to PM, 0.60 for PM_{10}, 0.031 for $PM_{2.5}$)

S = mean vehicle speed (4.6 mph – Utilized higher travel speed for conservatism)

a = constant (0.040 for PM, 0.051 for PM_{10}, 0.040 for $PM_{2.5}$)

b = constant (2.5 for PM, 2.0 for PM_{10}, 2.5 for $PM_{2.5}$)

Control Efficiency
Watering will immediately proceed the use of graders. As a result, an average control efficiency of 75% was utilized.

4.1.1.9 Support Vehicle Use

Process Rate
The annual, maximum daily, and hourly process rates for support vehicle use were provided by Rosemont based on anticipated needs for each mine plan year.

Except for the drills and shipment and delivery vehicles, the annual amount of VMTs for each type of support vehicle is based on usage determinations, which are anticipated to be consistent throughout the life of the mine.

For the drills, the annual, maximum daily, and hourly amounts of VMTs are determined by the distance traveled to prepare for a blast and the maximum number of blasts per year, day, or hour.

For the shipment and delivery trucks, the annual, maximum daily, and hourly amounts of VMTs are calculated by multiplying the number of shipments and deliveries in any given year, day, or hour by the distance the shipment and delivery trucks have to travel within the Copper World Project property boundaries.

The annual number of shipments and deliveries are calculated by dividing the quantity of the material being shipped or delivered by the capacity of the shipment or delivery truck. The quantities of material being shipped are assumed to be equal throughout the life of the mine except for the copper concentrate, copper cathodes produced, molten sulfur, diesel fuel delivery vehicles, and ANFO delivery vehicles which have specific values for each modeled mine life year. The daily amounts of shipments and deliveries, and the hourly amounts of shipments and deliveries, are based on the maximum number of shipments or deliveries the Copper World Project can accommodate in any one day or hour for each material.

The annual, maximum daily, and hourly VMT process rates, the support vehicle fleet size, and the support vehicle weight are presented in the emissions inventory in **Appendix F**.

<u>Emission Factor</u>
Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions resulting from the use of support vehicles on unpaved roads at the Copper World Project are calculated using Equations 3a and 3b. The surface material silt content (s, 5.0%) and number of days per year with greater than 0.01 inch of precipitation (p, 61 days/year) are equal to the values used to calculate the emission factor in **Section 4.1.1.4** above. Explanations for how these values are determined are presented in **Section 4.1.1.4** above.

The vehicle weight (W, tons) is the vehicle weight for each of the support vehicles that will be used at the Copper World Project. The vehicle weight values are presented in the emissions inventory in **Appendix F**.

<u>Control Efficiency</u>
Emissions of particulate matter resulting from water truck use on haul roads at the Copper World Project will be controlled by the application of water and/or chemical dust suppressant to the road surface. Additional details on haul road control efficiency are presented in **Section 2.4** above.

4.1.2 Primary Crushing, Conveying, Coarse Ore Storage, and Reclaim Conveying

4.1.2.1 Wind Erosion of the Temporary Ore Stockpile (Unit ID: PC01 – Year 2 and Year 8 Only)

<u>Process Rate</u>
The annual, daily, and hourly process rates for wind erosion of the temporary ore stockpile are equal to the maximum area of the land containing the stockpile (14 acres) and continuous operation of the stockpile (i.e., 8,760 hours/year, 24 hours/day, 1 hour/hour).

<u>Emission Factor</u>

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions due to wind erosion of the temporary ore stockpile are determined using the methodology and equations from AP-42, Section 13.2.5 (11/06), including:

$$EF = (k)\left(\sum_{i=1}^{N} P_i\right)\left(\frac{1\ lb}{453.59\ g}\right)\left(\frac{4{,}406.86\ m^2}{1\ acre}\right) \qquad (6a)$$

$$P = (58)(u^* - u_t^*)^2 + (25)(u^* - u_t^*) \qquad \text{for } u^*>u_t^* \qquad (6b)$$

$$P = 0 \qquad \text{for } u^* \leq u_t^* \qquad (6c)$$

$$u^* = (0.053)(u_{10}^+) \qquad (6d)$$

where:

EF = emission factor (lb/acre-year), the PM emission factor is assumed to be equal to the emission factor for PM_{30}

k = particle size multiplier (1 for PM, 0.5 for PM_{10}, 0.075 for $PM_{2.5}$)

P = erosion potential function

N = number of disturbances (1, temporary ore stockpile will only be disturbed when ore is added)

u^* = friction velocity (m/s)

u_t^* = threshold friction velocity (0.17 m/s, equal to mine tailings in Hayden, AZ from Table 4-4 of EPA Document, Control of Open Fugitive Dust Sources, September 1988)

u_{10}^* = fastest mile for the time period between disturbances (calculated using the linear regression proposed by ADEQ from previous project modeling and maximum hourly average wind speed (15.11 m/s) from the 2016-2020 Tucson AERMET file.)

Control Efficiency

Besides good operating practices, water sprays will be used as needed to control emissions from the temporary ore stockpile. An average control efficiency of 50% has been utilized based on review of published controls of wind erosion when utilizing water sprays.

4.1.2.2 Unprotected Transfer Points (Unit ID: Various)

Process Rate

The annual, daily, and hourly process rates are dependent on the point in the material processing process but are typically based on the respective ore mining rates. Process rates for transfers associated with the secondary process such as the secondary screen transfer points and the secondary crusher transfer points are dependent on anticipated routing to the secondary process and are shown in the emissions inventory included in **Appendix F**.

Emission Factor

Uncontrolled PM, PM10, and PM2.5 emissions from unprotected transfer points (indicated in the emissions inventory with Particulate Matter Process Code 'TrStnUnp') are calculated using Equation 2. The mean wind speed (U, 7.92 mph) and material moisture content (M, 3.5%) are equal to the values used to calculate the emission factors in **Section 4.1.5** above.

Control Efficiency

Various control technologies such as fogging sprays, dust collectors, water sprays, enclosures, and wet process are used to control emissions from unprotected transfer points and are documented in the emissions inventory included in **Appendix F**. Emissions of particulate matter resulting from unloading ore to the feed bins will be controlled by water fogging sprays. The fogging sprays have a control efficiency of 93%.

4.1.2.3 Rock Breaker and Primary Crusher (Unit ID: OCR02, OCR04, SCR02, SCR04)

Process Rate

The annual and daily process rate for the rock breakers and primary crushers is based on the maximum quantity of ore mined per year and per day (respectively). The hourly process rates are based on the respective maximum hourly crusher capacities. The utilization of the rock breakers is limited as they will only be relied upon in instances where blasting has not sufficiently fractured the material. It is estimated that only 1% of the total crusher throughput would require use of the rock breakers.

Emission Factor

Uncontrolled PM and PM_{10} emissions from the rock breakers and primary crushing are calculated using the emission factors of 0.50 lb/ton and 0.0.05 lb/ton, respectively, from AP-42, Table 11.24-2 (08/82) for primary crushing of low moisture ore. Although in practice, the moisture content of the crushed ore at the Copper World Project would possess a moisture content above 4%, which would classify the material as "high moisture" according to AP-42 Section 11.24.2, the low moisture ore emissions factors have been utilized to ensure conservatism.

Uncontrolled $PM_{2.5}$ emissions are estimated to be 18.5% of PM_{10} emissions based on the ratio of $PM_{2.5}$ to PM_{10} controlled emissions for tertiary crushing in AP-42, Table 11.19.2-2 (08/04). This is greater than the actual value because pollution control devices have a lower efficiency for smaller size particulates.

Control Efficiency

Emissions of particulate matter resulting from the oxide and sulfide rock breakers are controlled by the oxide and sulfide primary crusher fogging systems, respectively, with a control efficiency of 93%. Emissions of particulate matter from the oxide and sulfide primary crushers are controlled by the oxide area primary crusher cartridge dust collector and sulfide area primary crusher dust collector, respectively. The primary crushers are designed in a conical shape such that crushing and particulate matter generation occurs near the bottom of the crusher and is emitted through the exit of the crusher. The dust collectors have a control efficiency of 99%.

4.1.2.4 Oxide Secondary Feeder Screen (Unit ID: OCR16)

Process Rate

The annual and daily process rate for the oxide secondary feeder screen is based on the maximum quantity of ore mined per year and per day (respectively). The hourly process rate is based on the maximum hourly oxide ore crusher capacity.

Emission Factor

Uncontrolled PM and PM_{10} emissions from the secondary feeder screen are calculated using the emission factors of 0.025 lb/ton and 0.0087 lb/ton, respectively, from AP-42, Table 11.19.2-2 (08/04) screening. Uncontrolled $PM_{2.5}$ emissions are estimated to be 6.8% of PM_{10} emissions based on the ratio of $PM_{2.5}$ to PM_{10} controlled emissions for controlled screening in AP-42, Table 11.19.2-2 (08/04). This is greater than the actual value because pollution control devices have a lower efficiency for smaller size particulates.

Control Efficiency
Emissions of particulate matter resulting from the secondary feeder screen are controlled by the oxide secondary crusher dust collector system. The dust collector has a control efficiency of 99%.

4.1.2.5 Oxide Secondary Crusher (Unit ID: OCR23)

Process Rate
The annual, daily, and hourly process rate for the oxide secondary crusher is based on the portion of the mined oxide ore per year, per day, and per hour (respectively) that will be diverted to the secondary crusher (approximately 20%).

Emission Factor
Uncontrolled PM emissions from the secondary crusher are calculated using the emission factor of 1.2 lb/ton from AP-42, Table 11.24-2 (08/82). Uncontrolled PM_{10} and $PM_{2.5}$ emissions are estimated to be 45% and 18.5%, respectively of PM emissions based on the ratios of PM_{10} and $PM_{2.5}$ to PM controlled emissions for controlled tertiary crushing in AP-42, Table 11.19.2-2 (08/04). This is greater than the actual value because pollution control devices have a lower efficiency for smaller size particulates.

Control Efficiency
Emissions of particulate matter resulting from the secondary feeder screen are controlled by the oxide secondary crusher dust collector system. The dust collector has a control efficiency of 99%.

4.1.2.6 Wind Erosion of the Coarse Ore Stockpile (Unit ID: OCR10, SCR10)

Process Rate
The annual, daily, and hourly process rates for wind erosion of the coarse ore stockpiles are equal to the surface area of the stockpile building during each modeled operational mine year (oxide stockpile - 3 acres in all active years, sulfide stockpile – 2 acres in Year 2, 3 acres in Year 8 and 14) and continuous operation of the stockpile (i.e., 8,760 hours/year, 24 hours/day, 1 hour/hour).

Emission Factor
Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions due to wind erosion of the coarse ore stockpiles are determined using the methodology and equations from AP-42, Section 13.2.5, as documented in **Section 4.1.2.1** above.

Control Efficiency
Besides good operating practices, water sprays are used to control emissions from the coarse ore stockpiles. The water sprays will provide watering as needed to control particulate emissions. An average control efficiency of 50% has been utilized based on review of published controls of wind erosion when utilizing water sprays.

4.1.3 Milling

4.1.3.1 Sulfide SAG Mill (Unit ID: SCR15)

Process Rate
The annual, daily, and hourly process rates for the SAG mill are equal to the sulfide ore mining rates.

Emission Factor
Uncontrolled PM emissions from the secondary crusher are calculated using the emission factor of 1.2 lb/ton from AP-42, Table 11.24-2 (08/82). Uncontrolled PM_{10} and $PM_{2.5}$ emissions are estimated to be 45% and 18.5%, respectively of PM emissions based on the ratios of PM_{10} and $PM_{2.5}$ to PM controlled emissions for controlled tertiary crushing in AP-42, Table 11.19.2-2 (08/04). This is higher than the actual value because pollution control devices have a lower efficiency for smaller size particulates.

Control Efficiency
The SAG mill is a wet process where added moisture causes fine particles in the crushed ore to agglomerate such that no potential particulate emissions are formed, and a 100% control efficiency is assumed.

4.1.3.2 Pebble Crusher (Unit ID: SCR21)

Process Rate
The annual, daily, and hourly process rate for the pebble crusher is based on the portion of the mined sulfide ore per year, per day, and per hour (respectively) that will be diverted to the pebble crusher (approximately 20%).

Emission Factor
Uncontrolled PM and PM_{10} emissions from the pebble crusher are calculated using the emission factors of 2.70 lb/ton and 0.16 lb/ton, respectively, from AP-42, Table 11.24-2 (08/82) for tertiary crushing of low moisture ore.

Uncontrolled $PM_{2.5}$ emissions are estimated to be 18.5% of PM_{10} emissions based on the ratio of $PM_{2.5}$ to PM_{10} controlled emissions for tertiary crushing in AP-42, Table 11.19.2-2 (08/04). This is a higher than actual value because pollution control devices have a lower efficiency for smaller size particulates.

Control Efficiency
The pebble crusher is a wet process where added moisture causes fine particles in the crushed ore to agglomerate such that no potential particulate emissions are formed, and a 100% control efficiency is assumed.

4.1.4 Copper Concentrate Dewatering and Stockpiling

4.1.4.1 Material Transfers

This section discusses material transfers from the Copper Concentrate Filters to the Copper Concentrate Stockpile Building, from the Copper Concentrate Loadout Stockpile to shipment trucks via front end loader, and from the Copper Concentrate Stockpile Building Dust Collector Filtered Media Pump to the process circuit (Unit IDs: CCD01, CCD03 and CCD04).

Process Rate

The annual process rates for the material transfers from the copper concentrate filters to the copper concentrate loadout stockpile and from the copper concentrate loadout stockpile to the copper concentrate shipment trucks via front end loaders are based on past project experience.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the material transfers from the copper concentrate filters to the copper concentrate loadout stockpile, from the copper concentrate loadout stockpile to the copper concentrate shipment trucks and from the copper concentrate stockpile building dust collector filtered media pump to process are calculated using Equation 2. The filters are designed to remove 90% of the water from the copper concentrate such that a 10% material moisture content is used in Equation 2. The mean wind speed (U, 1.3 mph for protected transfer points and 7.92 mph for unprotected transfer points) is equal to the minimum value used to develop the AP-42 emission factors and the average wind speed out of the pit based on the 2016-2020 Tucson AERMET data, respectively.

Control Efficiency

The material transfers from the copper concentrate filters to the copper concentrate loadout stockpile and from the copper concentrate stockpile building dust collector filtered media pump to process area a wet process where added moisture causes fine particles in the crushed ore to agglomerate such that no potential particulate emissions are formed, and a 100% control efficiency is assumed. The copper concentrate loadout via front end loader is located within a building. Emissions from the building are controlled by the Copper Concentrate Building Dust Collector; therefore, emissions associated with the stockpile are represented by the dust collector emissions.

4.1.4.2 Copper Concentrate Loadout Stockpile (Unit ID: CCD02)

Process Rate

The copper concentrate stockpile is completely enclosed in a building. Emissions from the building are controlled by the Copper Concentrate Building Dust Collector; therefore, emissions associated with the stockpile are represented by the dust collector emissions.

4.1.5 Molybdenum Dewatering and Packaging

4.1.5.1 Molybdenum Material Transfers (Unit IDs: MD01, MD02 and MD04 through MD07)

Process Rate

The annual process rates for the material transfers associated with the molybdenum concentrate process were estimated from mine process knowledge.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the material transfers from the molybdenum concentrate filter to the molybdenum dryer and from the molybdenum dryer to the molybdenum concentrate packaging and weigh system are calculated using Equation 2. The plate and frame filter is designed to remove 85% of the water from the molybdenum concentrate. The dryer removes an additional 3% to 5% of moisture, resulting in a material moisture content of 10%. A material moisture content of 10% was used in Equation 2 for all molybdenum material transfers as a worst-case estimate.

The mean wind speed (U, 1.3 mph for protected transfer points and 7.92 mph for unprotected transfer points) is equal to the minimum value used to develop the AP-42 emission factors and the average wind speed out of the pit based on the 2016-2020 Tucson AERMET data, respectively.

Control Efficiency
Emissions of particulate matter resulting from the material transfers from the molybdenum concentrate feeder to the molybdenum dryer and from the molybdenum dryer to the molybdenum concentrate storage bin are enclosed and considered 100% controlled. Transfers of molybdenum concentrate from the storage bin to the bag feeder, from the bag feeder to the bag loader and from the bag loader to the truck for shipment are controlled by the molybdenum concentrate storage bin dust collector and bag loader dust collector. The dust collector has a control efficiency of 99%.

4.1.5.2 Molybdenum Drying (Unit ID: MD03)

Process Rate
The annual, maximum daily, and hourly process rates for the molybdenum dryer are equal to the molybdenum concentrate material transfer process rates as shown in the emissions inventory in **Appendix F**.

Emission Factor
Uncontrolled PM and PM_{10} emissions from the molybdenum dryer are calculated using the emission factors of 19.7 lb/ton and 12.0 lb/ton, respectively, from AP-42, Table 11.24-2 (08/82) for drying of all high moisture minerals except titanium/zirconium sands. The moisture content of the molybdenum concentrate is 15% prior to drying, which according to AP-42, Section 11.24.2 classifies the concentrate as high moisture. Uncontrolled $PM_{2.5}$ emissions are estimated to be 30% of PM emissions based on the information presented for Category 4, material handling and processing of processed ore, in AP-42, Appendix B.2 (08/04). Since the molybdenum dryer is heated using an electric hot oil heater, there are no combustion emissions from the molybdenum drying operations.

Control Efficiency
Emissions of particulate matter resulting from the molybdenum drying are collected and processed by the molybdenum scrubber system. The scrubber system has a 100% capture efficiency and a control efficiency of 99%.

4.1.6 Tailings Storage

4.1.6.1 Tailings Storage (Unit ID: TDS19)

Process Rate
The annual, daily, and hourly process rates for wind erosion of the tailings storage are equal to the maximum area of the land containing the tailings that are susceptible to wind erosion (500 acres). This represents the area that is not actively wetted or covered with ponded tailings fluid. The tailings storage assumes continuous operation of the storage area (i.e., 8,760 hours/year, 24 hours/day, 1 hour/hour).

Emission Factor
Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the tailings storage facilities are calculated using the methodology and equations from AP-42, Section 13.2.5 (11/06), as documented in **Section 4.1.2.1** above.

Control Efficiency

Emissions of particulate matter resulting from wind erosion of the tailings storage are controlled by ponding and the crustal formation that occurs during drying.

4.1.7 Fuel Burning Equipment

4.1.7.1 Plant Area Emergency Generators (Unit IDs: FB01 through FB03)

Process Rate

The annual, daily, and hourly process rates for the diesel fueled emergency generators are based on the power ratings of the generators and the hours of operation. The emergency generators have power ratings of 1,345 kW. All emergency generators will only be used in emergency power situations and for periodic testing and maintenance purposes, estimated at 500 hours/year (see EPA memorandum distributed on September 6, 1995, providing guidance on calculating the PTE for emergency generators). However, the emergency generators are capable of operating 24 hours/day and 1 hour/hour. Although PTE is calculated based on 500 hours/year, actual operation for testing, maintenance and other purposes will range from 100 to 50 hours or less a year consistent with NSPS and NESHAP requirements to maintain emergency status.

Emission Factor

Uncontrolled PM, PM_{10}, $PM_{2.5}$, CO, NO_x, and VOC emissions from the emergency generators are calculated using the exhaust emission standards for nonroad engines from the new source performance standards (NSPS), 40 CFR 89, Section 112. The emission standards for the emergency generators with engines rated greater than 560 kW and manufactured after 2006 (Tier 2) are presented in the emissions inventory in **Appendix F**. PM_{10} and $PM_{2.5}$ emissions from internal combustion engines are not listed as emission standards and are assumed to be equal to PM emissions. The NO_x and VOC emission standards are combined in the NSPS as a single emission standard. Based on EPA documentation (*Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition*), NO_x and VOC emissions for engines greater than 560 kW are assumed to be equal to 93.75% and 6.25%, respectively, of the combined NO_x and VOC emission standard.

Uncontrolled SO_2 emissions are calculated assuming all the sulfur in the diesel fuel is converted to SO_2 emissions, and the sulfur content of the diesel fuel is 0.0015%. This leads to an uncontrolled SO_2 emission factor of 0.00003-pound SO_2 per pound of diesel fuel (or 0.0066 grams of SO_2 per kW-hr). Uncontrolled HAP emissions are calculated using the emission factors from AP-42, Tables 3.4-3 and 3.4-4 (10/96) for large (> 600 hp) stationary, diesel engines.

Uncontrolled CO_2, CH_4, and N_2O emissions are calculated using the emission factors of 73.96 kg/MMBtu, $3*10^{-3}$ kg/MMBtu, and $6*10^{-4}$ kg/MMBtu, respectively, from 40 CFR 98, Tables C-1 and C- 2 for distillate fuel oil No. 2.

A diesel heating value of 19,300 Btu/pound of diesel fuel, an average brake-specific fuel consumption value of 7,000 Btu/hp-hr, and a diesel fuel density of 7.3775 lb/gallon were used to calculate the HAP emissions and the SO_2, CO_2, CH_4, and N_2O emission factors in terms of g/kW-hr.

Control Efficiency

Besides good operating practices and inherent controls built into the design of the generators, other pollution control methods are not implemented during the use of the generators.

4.1.7.2 Primary Crusher Fire Water Pump (Unit IDs: FB04)

Process Rate

The annual, daily, and hourly process rates for the diesel fueled primary crusher fire water pump are based on the power ratings of the fire pumps and the hours of operation. The fire water pump has a power rating of 400 hp (298.4 kW) and will only be used in emergency situations and for periodic testing and maintenance purposes, estimated at 500 hours/year (see EPA memorandum distributed on September 6, 1995, providing guidance on calculating the PTE for emergency generators). However, the fire water pump is capable of operating 24 hours/day and 1 hour/hour. Although PTE is calculated based on 500 hours/year, actual operation for testing, maintenance and other purposes will range from 100 to 50 hours or less a year consistent with NSPS and NESHAP requirements to maintain emergency status.

Emission Factor

Uncontrolled PM, PM_{10}, $PM_{2.5}$, CO, NO_x, and VOC emissions from the fire water pump are calculated using the emission standards for stationary fire pump engines from NSPS, 40 CFR 60, Subpart IIII, Table 4. The emission standards for fire pump engines rated between 225 and 450 kW and manufactured after 2009 are presented in in the emissions inventory in **Appendix F**. PM_{10} and $PM_{2.5}$ emissions from fire pump engine is not listed as emission standards and are assumed to be equal to PM emissions. The NO_x and VOC emission standards are combined in the NSPS as a single emission standard. Based on EPA documentation (*Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition*), NO_x and VOC emissions for engines between 300 and 600 hp are assumed to be equal to 93.33% and 6.67%, respectively, of the combined NO_x and VOC emission standard.

Uncontrolled SO_2 emissions are calculated assuming all the sulfur in the diesel fuel is converted to SO_2 emissions, and the sulfur content of the diesel fuel is 0.0015%. This leads to an uncontrolled SO_2 emission factor of 0.00003-pound SO_2 per pound of diesel fuel (or 0.0066 grams of SO_2 per kW-hr). Uncontrolled HAP emissions are calculated using the emission factors from AP-42, Table 3.3-2 (10/96) for industrial diesel engines.

Uncontrolled CO_2, CH_4, and N_2O emissions are calculated using the emission factors of 73.96 kg/MMBtu, $3*10^{-3}$ kg/MMBtu, and $6*10^{-4}$ kg/MMBtu, respectively, from 40 CFR 98, Tables C-1 and C- 2 for distillate fuel oil No. 2.

A diesel heating value of 19,300 Btu/pound of diesel fuel, an average brake-specific fuel consumption value of 7,000 Btu/hp-hr, and a diesel fuel density of 7.3775 lb/gallon were used to calculate the HAP emissions and the SO_2, CO_2, CH_4, and N_2O emission factors in terms of g/kW-hr.

Control Efficiency

Besides good operating practices, other pollution control methods are not implemented during the use of the fire water pump.

4.1.8 Miscellaneous Sources

4.1.8.1 Lime Loading (Unit ID: MS01)

Process Rate

The annual process rate for the lime loading is based on an annual lime usage rate of 32,120 tons in Year 2, 56,210 tons in Year 8 and 48,180 tons in Year 14. The usage rate varies throughout the life of the mine but is expected to be at a maximum in Year 8. The maximum daily process rate is calculated from the annual usage rate divided by 365 days/year, the quantity of days per year lime will be used at the Copper World Project. The hourly process rate is determined by dividing the maximum daily usage rate by 24 hours/day.

Emission Factor

Uncontrolled PM emissions from the lime loading are calculated using the emission factor of 0.61 lb/ton, from AP-42, Table 11.17-4 (02/98) for lime product loading, enclosed truck. Uncontrolled PM_{10} and $PM_{2.5}$ emissions are estimated to be 47% and 7.2%, respectively, of PM emissions based on the particle size fractions in AP-42, Section 13.2.4.3 (11/06) for aggregate drop processes.

Control Efficiency

Emissions of particulate matter resulting from loading lime into the storage vessels are controlled by the quick lime dust collector system. The dust collector system is designed to be used as a collector to prevent the loss of material, but also treat the dust entrained displacement air generated during the loading process. The dust collector system has a pickup efficiency of 100% (it will be located directly on the storage containers) and a 99% control efficiency, as determined by the dust collector vendor.

4.1.8.2 Lime Slaking Mill (Unit ID: MS05)

Process Rate

The annual process rate for the lime slaking mill is based on an annual lime usage rate of 32,120 tons in Year 2, 56,210 tons in Year 8 and 48,180 tons in Year 14. The usage rate varies throughout the life of the mine but is expected to be at a maximum in Year 8. The maximum daily process rate is calculated from the annual usage rate divided by 365 days/year, the quantity of days per year lime will be used at the Copper World Project. The hourly process rate is determined by dividing the maximum daily usage rate by 24 hours/day.

Emission Factor

Uncontrolled PM emissions from the lime loading are calculated using the emission factor of 8.0 lb/ton, from AP-42, Table 11.17-2 (02/98) for atmospheric hydrator with wet scrubber. A control efficiency of 99% for the wet scrubber was used to back-calculate the uncontrolled PM emission factor.

Control Efficiency

The lime slaking mill is a wet process; therefore, it is considered to be 100% controlled.

4.1.8.3 Reagent Material Transfer Points (Unit IDs: MS02-MS04, MS06, MS08- MS16)

Process Rate

The annual process rates for the reagent material transfer points are based on the annual reagent usage rates presented in the emissions inventory in **Appendix F**. The usage rates will vary throughout the life of the mine but are expected to be at a maximum in Year 8. The maximum daily process rates are calculated from the annual usage rates divided by 365 days/year, the quantity of days per year reagents will be used at the Copper World Project. The hourly process rate is determined by dividing the maximum daily usage rate by 24 hours/day.

Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions from the reagent material transfer points are calculated using Equation 2. The mean wind speed (U, 7.92 mph for unprotected transfer points) is the average wind speed out of the pit (based on 2016-2020 Tucson AERMET data). The material moisture content value used in

Equation 2 is unknown for the different chemicals. A 1% material moisture content is used as a worst-case scenario.

Control Efficiency

Emissions of particulate matter resulting from the reagent material transfer points are controlled either by good operating practices, enclosures, dust collector systems - or they are wet processes. When process material is transferred to an enclosed piece of equipment, particulate emissions are controlled due to the emissions not being able to escape and a 100% control efficiency is assumed. The dust collector systems provide a 100% pick up efficiency and a 99% control efficiency of particulate emissions (as determined by the dust collector vendors). Wet processes are considered 100% controlled. The particulate matter control method used at each reagent material transfer point is presented in the emissions inventory in **Appendix F**.

4.1.9 Solvent Extraction and Electrowinning

4.1.9.1 Solvent Extraction Mix Tanks and Settlers (Unit IDs: SXE01)

Process Rate

The annual, daily, and hourly process rates for the solvent extraction mix tanks and settlers are equal to the surface area of the tanks and continuous operation of the solvent extraction system (i.e., 8,760 hours/year, 24 hours/day, 1 hour/hour). The surface area of the solvent extraction mix tanks and settlers is presented in **Table 4-1** below.

Table 4-1. Surface Area of the Solvent Extraction Mix Tanks and Settlers

Solvent Extraction Mix Tank or Settler	Surface Area (ft^2)
5 DOP Tanks (13.125' D x 9.83' H each)	676.5
5 DOP Turbine Tanks (5.25' D x 5.73' H each)	108.2
5 Spirok Mixer Tanks (13.125' D x 19.6875' H each)	676.5
5 Spirok Mixer Tanks (9.28' D x 15.135' H each)	338.2
5 Extraction Settlers (104' L x 47.99' W x 8' H each)	24,955
Total	26,754

Emission Factor

Uncontrolled VOC and HAP emissions from the solvent extraction tanks are calculated using the methodology and equations from the Hydrometallurgy of Copper, presented at an international copper mining convention in 1999. The methodology presented in the paper is a more accurate way to estimate the evaporative loss of diluent than using the EPA Tanks program to model the mixers and settlers as tanks. The following equations (Equations 1a and 1b) and data (see **Table 4-2** below) are used to calculate VOC and HAP emissions from the solvent extraction mix tanks and settlers. The full paper is presented in **Appendix G**.

$$F_i = \frac{\left(C_i^0 - C_i^H\right)\left(\frac{D_i}{100^2}\right)}{(H)}\left(\frac{60\ \text{sec}}{1\ \text{min}}\right)\left(\frac{60\ \text{min}}{1\ \text{hr}}\right)\left(\frac{1\ \text{lb}}{453.59\ \text{g}}\right)\left(\frac{1\ \text{m}^2}{(3.2808\ \text{ft})^2}\right) \qquad (1a)$$

$$D_i = \left(10^{-3}\right)\left(T^{1.75}\right)\left(\frac{\left(\frac{(M_i + M_A)}{(M_i)(M_A)}\right)^{1/2}}{\left((P)\left(V_i^{1/3} + V_A^{1/3}\right)\right)^2}\right) \qquad (1b)$$

where:

F_i	=	diffusive flux of component i in the air (lb/ft^2-hr)
C_i^0	=	component concentration at the surface (g/m^3, see Table 4-2)
C_i^H	=	component concentration at the measured height (g/m^3, see Table 4-2)
H	=	height at which concentration measurement was taken (1 m)
D_i	=	diffusivity of component i in the air (m^2/s)
T	=	temperature (335.6 K, the average value calculated from hourly data collected at the meteorological station at the RCP from April 2006 through May 2009)
M_i	=	molecular weight of the component in the air (gram/gram-mole, see Table 4-2)
M_A	=	molecular weight of the air (28.97 gram/gram-mole)
P	=	pressure (0.8 atm, calculated based on the elevation at the RCP (5,350 ft) and the estimate that for every 1,000 feet above sea level, the pressure decreases by 1 inch of mercury.)
V_i	=	sum of atmospheric diffusion volume increments by atom and structure for the component in the air (see Table 4-2)
V_A	=	sum of atmospheric diffusion volume increments by atom and structure for air (20.10)

Table 4-2. Data Used to Calculate VOC and HAP Emissions from the Solvent Extraction Mix Tanks and Settlers

Data	Benzene	Toluene	Ethylbenzene	Xylenes	Others (including Hexane)[a]
C_i^0 (ppm$_v$)	25	350	1400	1912	2500
C_i^H (ppm$_v$)	0.0018	0.0668	0.0568	0.0371	16.921
M_i (g/g-mole)	78.11	92.13	106.16	106.16	--
V_i	90.68	111.14	131.6	131.6	--

a. The diffusivity of the "other" component (D_{other}) is given in the Hydrometallurgy of Copper as 0.07. It is corrected for the temperature and pressure associated with the former Rosemont Copper Project (RCP) to be 0.10.

4.1.10 Sulfuric Acid Plant

Process Rate
The annual, daily, and hourly process rates for the sulfuric acid plant assume continuous operation of the plant (24 hours/day, 8,760 hours/year).

Emission Factor
The acid plant will be a source of particulates, sulfuric acid (as particulate), SO_2, NO_x and CO. The particulate emissions will be controlled by the acid plant scrubber; emissions are calculated based on the acid plant scrubber design control maximum emissions rate of 0.02 gr/dscf and a flow rate of 30,000 acfm. The emission factors for SO_2, NO_x and CO are based on best available modern facility design and emissions controls and are provided in units lb SO_2/ton H_2SO_4, lb NO_x/ton H_2SO_4 and lb/hr, respectively. The plant will produce approximately 413,000 tons of H_2SO_4 per year.

4.1.11 Dust Collectors and Scrubbers

Process Rate
The annual, daily, and hourly process rates for the dust collectors and scrubbers are based on the exhaust flow rate of the equipment and/or the hours of operation. The exhaust flow rate and the operating hours for each piece of pollution control equipment is presented in the emissions inventory in **Appendix F**. The particulate matter pollution control equipment is assumed to operate at maximum capacity and continuous operation throughout the life of the mine even if the processes being controlled are operating at less than maximum capacity.

Emission Factor
Particulate matter emissions from the pollution control devices are based on PM outlet grain loadings provided by the equipment vendor. The PM_{10} and $PM_{2.5}$ fractions of PM emissions are estimated based on the ratios of PM10 and PM2.5 to PM for the materials that each emission unit controls. The PM grain loading and particulate size ratios are presented in the emissions inventory in **Appendix F**.

4.2 Emission Summary

The potential emissions of regulated air pollutants resulting from the proposed Copper World Project are summarized in **Tables 4-3 through 4-5** below.

Table 4-3. Copper World Project Stationary and Fugitive PTE* – Year 2

Description	Pollutant (tpy)													
	PM	PM10	PM2.5	Lead	CO	NO_X	SO_2	VOC	H_2SO4	CO_2	CH_4	N_2O	HAP	GHG
Total Fugitives	875.07	266.19	33.96	0.09	123.11	3.31	0.01	0.00	0.00E+00	693.90	0.03	0.01	1.41	695.08
Total Point Source Emissions	61.96	35.48	23.81	0.01	9.90	33.13	13.71	13.44	16.97	1658.14	0.07	0.01	9.79	1664.88
Nested Source (Includes Fugitives)	23.78	18.68	17.09	--	1.05	18.19	13.68	--	16.92	--	--	--	--	--
Copper World Project Site-Wide PTE	**937.02**	**301.67**	**57.77**	**0.09**	**133.01**	**36.44**	**13.71**	**13.44**	**16.97**	**2352.04**	**0.10**	**0.02**	**11.20**	**2359.96**
Federal NSR Thresholds (tpy)	250	250	250	250	250	250	250	250	250	N/A	N/A	N/A	N/A	N/A
Federal NSR Thresholds Nested Source(tpy)	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/A	N/A
Above Nested Source Thresholds?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*
Above Projectwide NSR Thresholds?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*
Class I Permit Thresholds (tpy)	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	25	N/A
Above Class I Thresholds?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*

*Tailpipe emissions not included in total fugitives

Table 4-4. Copper World Project Stationary and Fugitive PTE* – Year 8

Description	Pollutant (tpy)													
	PM	PM10	PM2.5	Lead	CO	NO_X	SO_2	VOC	H_2SO4	CO_2	CH_4	N_2O	HAP	GHG
Total Fugitives	3124.09	903.06	97.21	0.36	471.35	12.66	0.03	0.00	0.00E+00	2656.65	0.11	0.02	4.78	2673.95
Total Point Source Emissions	62.18	35.60	23.86	0.01	10.31	33.17	13.70	13.46	16.97	1658.14	0.07	0.01	9.79	1664.88
Nested Source (Includes Fugitives)	24.26	18.81	17.11	--	1.05	18.19	13.68	--	16.92	--	--	--	--	--
Copper World Project Site-Wide PTE	**3186.27**	**938.67**	**121.07**	**0.36**	**481.65**	**45.83**	**13.73**	**13.46**	**16.97**	**4314.79**	**0.18**	**0.04**	**14.57**	**4338.83**
Federal NSR Thresholds (tpy)	250	250	250	250	250	250	250	250	250	N/A	N/A	N/A	N/A	N/A
Federal NSR Thresholds Nested Source(tpy)	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/A	N/A
Above Nested Source Thresholds?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*
Above Projectwide NSR Thresholds?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*
Class I Permit Thresholds (tpy)	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	25	N/A
Above Class I Thresholds?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*

*Tailpipe emissions not included in total fugitives

Table 4-5. Copper World Facility Project Stationary and Fugitive PTE*– Year 14

Description	Pollutant (tpy)													
	PM	PM10	PM2.5	Lead	CO	NO_X	SO_2	VOC	H_2SO4	CO_2	CH_4	N_2O	HAP	GHG
Total Fugitives	3961.30	1097.40	117.78	0.46	603.00	16.20	0.03	0.00	0.00E+00	3398.70	0.14	0.03	6.03	3427.01
Total Point Source Emissions	62.10	35.56	23.85	0.01	10.51	33.18	13.70	13.46	16.97	1658.14	0.07	0.01	9.79	1664.88
Nested Source (Includes Fugitives)	24.26	18.81	17.11	--	1.05	18.19	13.68	--	16.92	--	--	--	--	--
Copper World Project Site-Wide PTE	**4023.40**	**1132.97**	**141.62**	**0.46**	**613.51**	**49.38**	**13.74**	**13.46**	**16.97**	**5056.84**	**0.21**	**0.04**	**15.82**	**5091.90**
Federal NSR Thresholds (tpy)	250	250	250	250	250	250	250	250	250	N/A	N/A	N/A	N/A	N/A
Federal NSR Thresholds Nested Source(tpy)	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	N/A	N/A
Above Nested Source Thresholds?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*
Above Projectwide NSR Thresholds?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*
Class I Permit Thresholds (tpy)	100	100	100	100	100	100	100	100	100	N/A	N/A	N/A	25	N/A
Above Class I Thresholds?	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*

*Tailpipe emissions not included in total fugitives

APPENDIX A. REVISED EQUIPMENT LIST

Revised Equipment List

Equipment	Qty	Max Capacity	Make / Model	Date of Manufacture	Equipment ID / Serial Number	NSPS / A.A.C
Oxide Ore Process						
Oxide ROM Feed Bin	1	45,000 tons			OBN-001	NSPS Subpart LL
Oxide Rock Breaker	1	45,000 tons			0XX-001	NSPS Subpart LL
Oxide Primary Crusher	1	45,000 tons			OCR-001	NSPS Subpart LL
Oxide Primary Crusher Discharge Chute	1	45,000 tons			ODU-001	NSPS Subpart LL
Oxide Primary Crusher Discharge Conveyor	1	45,000 tons			OCV-001	NSPS Subpart LL
Oxide Primary Crusher Conveyor Discharge Chute	1	45,000 tons			ODU-002	NSPS Subpart LL
Oxide Stockpile Feed Conveyor	1	45,000 tons			OCV-002	NSPS Subpart LL
Oxide Stockpile Reclaim Feeder	3	45,000 tons			OFE-001, OFE-002, OFE-003	NSPS Subpart LL
Oxide Stockpile Reclaim Feeder Discharge Chute	3	45,000 tons			ODU-003, ODU-004, ODU-005	NSPS Subpart LL
Oxide Stockpile Reclaim Conveyor	1	45,000 tons			OCV-003	NSPS Subpart LL
Oxide Stockpile Reclaim Conveyor Discharge Chute	1	45,000 tons			ODU-006	NSPS Subpart LL
Oxide Secondary Feeder Screen	1	45,000 tons			OSN-001	NSPS Subpart LL
Oxide Secondary Feeder Screen Discharge Chute	1	36,000 tons			ODU-007	NSPS Subpart LL
Oxide Secondary Crusher Discharge Conveyor	1	36,000 tons			OCV-004	NSPS Subpart LL
Oxide Secondary Crusher Feed Bin	1	9,000 tons			OBN-002	NSPS Subpart LL
Oxide Secondary Crusher Belt Feeder	1	9,000 tons			OFE-004	NSPS Subpart LL
Oxide Secondary Crusher Belt Feeder Discharge Chute	1	9,000 tons			ODU-008	NSPS Subpart LL
Oxide Secondary Crusher	1	9,000 tons			OCR-002	NSPS Subpart LL
Oxide Secondary Crusher Discharge Chute	1	9,000 tons			ODU-009	NSPS Subpart LL
Agglomerator	1	45,000 tons			TBD	NSPS Subpart LL
Heap Feed Conveyor	1	45,000 tons			TBD	NSPS Subpart LL

Heap Feed Stackers	6	45,000 tons			TBD	NSPS Subpart LL
Sulfide Ore Process						
Sulfide ROM Feed Bin	1	60,000 tons			SBN-001	NSPS Subpart LL
Sulfide Rock Breaker	1	60,000 tons			SXX-001	NSPS Subpart LL
Sulfide Primary Crusher	1	60,000 tons			SCR-001	NSPS Subpart LL
Sulfide Primary Crusher Discharge Chute	1	60,000 tons			SDU-001	NSPS Subpart LL
Sulfide Primary Crusher Discharge Conveyor	1	60,000 tons			SCV-001	NSPS Subpart LL
Sulfide Primary Crusher Discharge Conveyor Discharge Chute	1	60,000 tons			SDU-002	NSPS Subpart LL
Sulfide Stockpile Feed Conveyor	1	60,000 tons			SCV-002	NSPS Subpart LL
Sulfide Stockpile Reclaim Feeders	3	60,000 tons			SFE-001, SFE-002, SFE-003	NSPS Subpart LL
Sulfide Stockpile Reclaim Feeder Discharge Chutes	3	60,000 tons			SDU-003, SDU-004, SDU-005	NSPS Subpart LL
Sulfide SAG Mill Feed Conveyor	1	72,000 tons			SCV-003	NSPS Subpart LL
Sulfide SAG Mill	1	60,000 tons			SAG-001	NSPS Subpart LL
Sulfide Pebble Crusher Feed Bin	1	12,000 tons			SBN-002	NSPS Subpart LL
Sulfide Pebble Crusher Belt Feeder	1	12,000 tons			SFE-004	NSPS Subpart LL
Sulfide Pebble Crusher Belt Feeder Discharge Chute	1	12,000 tons			SDU-006	NSPS Subpart LL
Sulfide Pebble Crusher	1	12,000 tons			SCR-002	NSPS Subpart LL
Sulfide Pebble Crusher Discharge Chute	1	12,000 tons			SDU-007	NSPS Subpart LL
Sulfide Pebble Crusher Product Conveyor	1	12,000 tons			SCV-004	NSPS Subpart LL
Sulfide Pebble Crusher Product Conveyor Discharge Chute	1	72,000 tons			SDU-008	NSPS Subpart LL
Copper Concentrate Dewatering and Stockpiling						
Copper Concentrate "Stockpile" Building	1	1,400 tons			CSP-001	AZ SIP Rule 9-3-521
Copper Concentrate Stockpile Building Dust Collector	1	1,400 tons			CDC-001	NSPS Subpart LL
Molybdenum Dewatering and Packaging						
Molybdenum Dryer Screw Feeder/Conveyor	1	9 tons			MCV-001	NSPS Subpart LL

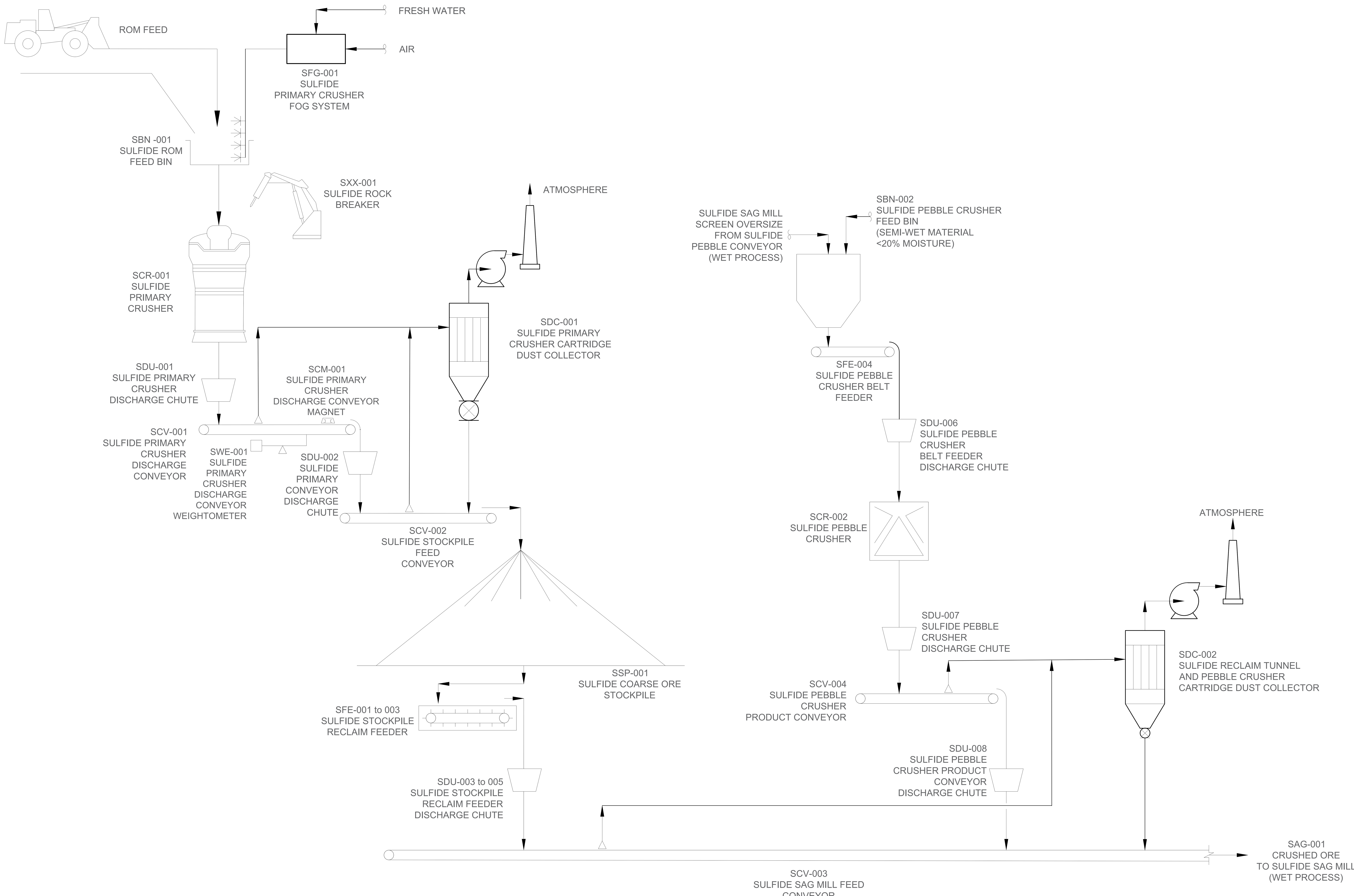
Molybdenum Dryer	1	9 tons			MDR-001	NSPS Subpart LL
Molybdenum Concentrate Storage Bin	1	9 tons			MBN-001	NSPS Subpart LL
Molybdenum Concentrate Bag Feeder	1	9 tons			MBF-001	NSPS Subpart LL
Molybdenum Concentrate Bag Feeder/Conveyor	1	9 tons			MCV-001	NSPS Subpart LL
Molybdenum Concentrate Bag Loader	1	9 tons			MBL-001	NSPS Subpart LL
Fuel Burning Equipment						
Emergency Power Generator #1	1	1,345 kW			GEN-001	NSPS Subpart IIII, NESHAP Subpart ZZZZ
Emergency Power Generator #1	1	1,345 kW			GEN-002	NSPS Subpart IIII, NESHAP Subpart ZZZZ
Emergency Power Generator #1	1	1,345 kW			GEN-003	NSPS Subpart IIII, NESHAP Subpart ZZZZ
Primary Crusher Fire Water Pump	1	400 hp			GEN-004	NSPS Subpart IIII, NESHAP Subpart ZZZZ
Miscellaneous Sources - Quicklime						
QuickLime Storage Silo	1	TBD			LSO-001	A.A.C 730
QuickLime Screw Feeder/Conveyor	1	TBD			LCV-001	A.A.C 730
Lime Slaking Mill Feed Chute	1	TBD			LDU-001	A.A.C 730
QuickLime Slaking Mill	1	TBD			LML-001	A.A.C 730
Lime Transfer Pump Discharge Chute	1	TBD			LDU-002	A.A.C 730
Miscellaneous Sources – Flocculant (Concentrate Leach)						
Concentrate Leach Flocculant Bulk Bags	1	TBD			TBD	A.A.C 730
Concentrate Leach Flocculant Feed Bin	1	TBD			FBN-001	A.A.C 730

Concentrate Leach Flocculant Screw Feeder/Conveyor	1	TBD			FCV-001	A.A.C 730
Concentrate Leach Flocculant Heated Receiving Hopper	1	TBD			FHP-001	A.A.C 730
Concentrate Leach Flocculant Venturi and Mixing Tank	1	TBD			TBD	A.A.C 730
Miscellaneous Sources – Flocculant (Mill Tailings)						
Mill Tailings Flocculant Bulk Bags	1	TBD			TBD	A.A.C 730
Mill Tailings Flocculant Feed Bin	1	TBD			FBN-002	A.A.C 730
Mill Tailings Flocculant Screw Feeder/Conveyor	1	TBD			FCV-002	A.A.C 730
Mill Tailings Flocculant Heated Receiving Hopper	1	TBD			FHP-002	A.A.C 730
Mill Tailings Flocculant Venturi and Mixing Tank	1	TBD			TBD	A.A.C 730
Particulate Matter Pollution Control Equipment						
Primary Crusher Fog System - Oxide Ore	1	TBD	Fog System		OFG-001	A.A.C.721
Primary Crusher Cartridge Dust Collector - Oxide Ore	1	5,000 acfm	Cartridge		ODC-001	A.A.C.721
Oxide Secondary Crusher Cartridge Dust Collector	1	33,000 acfm	Cartridge		ODC-002	A.A.C.721
Primary Crusher Fog System - Sulfide Ore	1	TBD	Fog System		SFG-001	A.A.C.721
Primary Crusher Cartridge Dust Collector - Sulfide Ore	1	10,000 acfm	Cartridge		SDC-001	A.A.C.721
Sulfide Reclaim Tunnel & Pebble Crusher Cartridge Dust Collector	1	66,000 acfm	Cartridge		SDC-002	A.A.C.721
Copper Concentrate Building Dust Collector	1	55,000 acfm	Cartridge		CDC-001	A.A.C.721
Molybdenum Flotation Scrubber	1	1,500 acfm	Wet Scrubber		MSB-001	A.A.C.721
Molybdenum Concentrate Storage Bin Dust Collector	1	500 acfm	Cartridge		MDC-001	A.A.C.721
Molybdenum Bag Loader Dust Collector	1	500 acfm	Cartridge		MDC-002	A.A.C.721
Molybdenum Dryer Scrubber	1	500 acfm	Cyclone Scrubber		MSB-002	A.A.C.721
Quicklime Dust Collector	1	1,159 acfm	Cartridge		LDC-001	A.A.C.721
Lime Scrubber	1	500 acfm	Wet Scrubber		LSB-001	A.A.C.721

Concentrate Leach Flocculant Feed Bin Cartridge Dust Collector	1	500 acfm	Cartridge		FDC-001	A.A.C.721
Laboratory Dust Collector	1	10,000 acfm	Cartridge		BDC-001	A.A.C.721
Laboratory Dust Collector	1	10,000 acfm	Cartridge		BDC-002	A.A.C.721
Laboratory Scrubber	1	10,000 acfm	Wet Scrubber		BSB-001	A.A.C.721
Mill Tailings Flocculant Feed Bin Cartridge Dust Collector	1	500 acfm	Cartridge		FDC-002	A.A.C.721
Collector Storage and Distribution Tanks Stack	1	1,000 acfm	Stack Fed by Ventilation Centrifugal Fan		TFA-001	A.A.C.721
Collector Area Ventilation Fan Stack	1	500 acfm	Stack Fed by Ventilation Centrifugal Fan		TFA-002	A.A.C.721
Acid Plant Scrubber	1	30,000 acfm	Wet Scrubber		ASB-001	A.A.C.721
Refinery Dust Collector	1	10,000 acfm	Cartridge		3842-DC-002	A.A.C.721
Solvent Extraction and Electrowinning						
DOP Tanks (13.125' D x 9.83' H each)	5	676.5 ft^2			TBD	A.A.C 730
DOP Turbine Tanks (5.25' D x 5.73' H each)	5	108.2 ft^2			TBD	A.A.C 730
Spirok Mixer Tanks (13.125' D x 19.6875' H each)	5	676.5 ft^2			TBD	A.A.C 730
Spirok Mixer Tanks (9.28' D x 15.135' H each)	5	338.2 ft^2			TBD	A.A.C 730
Extraction Settlers (104' L x 47.99' W x 8' H each)	5	24,955 ft^2			TBD	A.A.C 730
Electrowinning Plant Scrubber	1	30,000 scfm	Wet Scrubber		ESB-001	A.A.C 730
Electrowinning Plant Scrubber	1	18,000 scfm	Wet Scrubber		ESB-002	A.A.C 730
Tanks						
C7 Distribution Tank	1	11,845 gallons			T-C7D	A.A.C 730
MIBC Storage Tank	1	11,845 gallons			T-MIBCS	A.A.C 730
Diesel Fuel Storage Tank - Heavy Vehicles	2	100,000 gallons			T-DFS-HV1	A.A.C 730
Gasoline Fuel Storage Tank	1	10,000 gallons			TBD	A.A.C 710 Pima SIP 314.A.1

APPENDIX B. REVISED MODELING REPORT

APPENDIX C. REVISED PROCESS FLOW DIAGRAMS



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HUDBAY

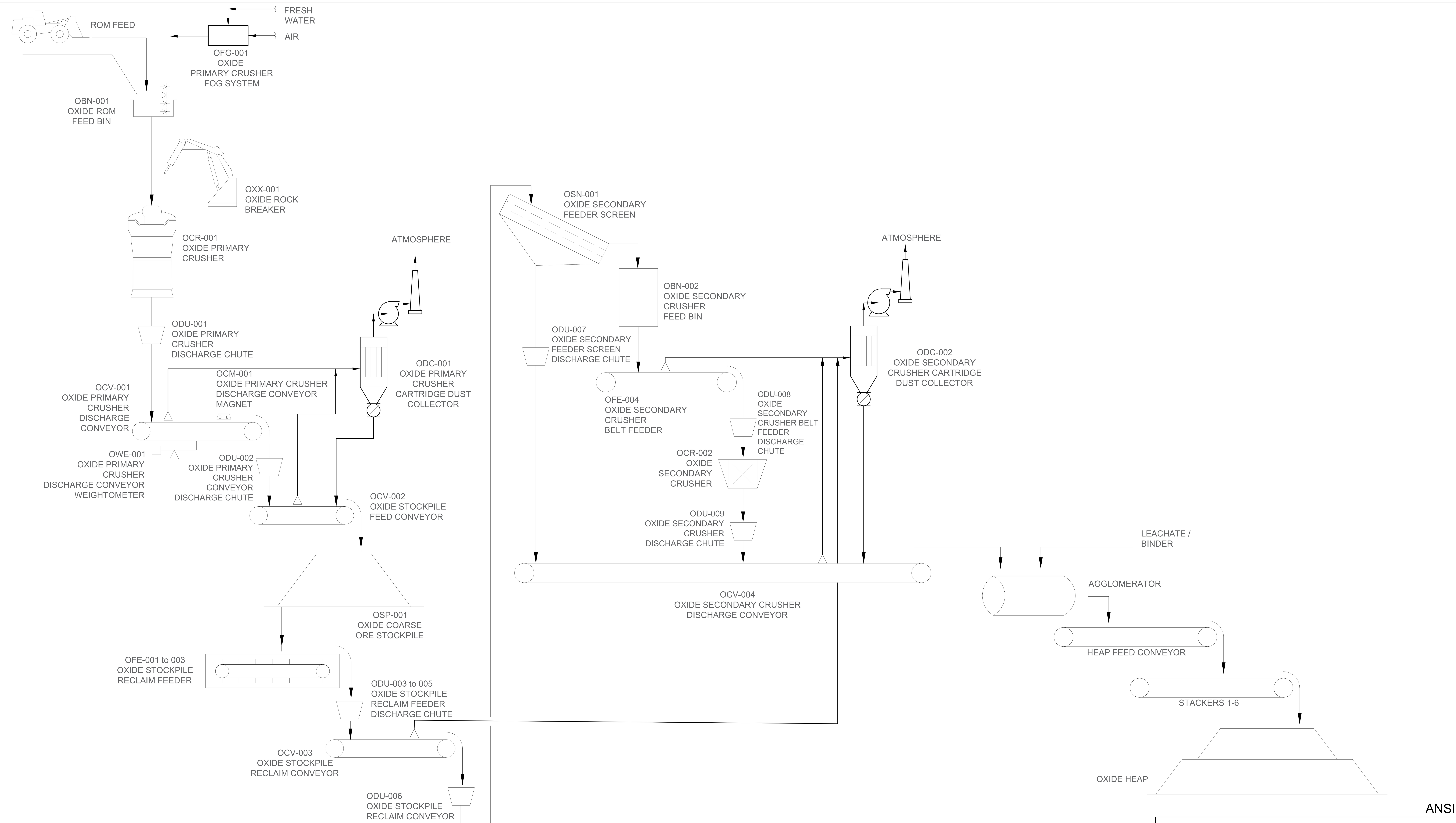
COPPER WORLD PROJECT

PROCESS PLANT
PROCESS FLOW DIAGRAM
EMISSION POINTS
SHEET 1 OF 7

CONTRACTOR DWG. NO.

DWG. NO. 300-V-010

REVISION 0 | DATE 24APR23



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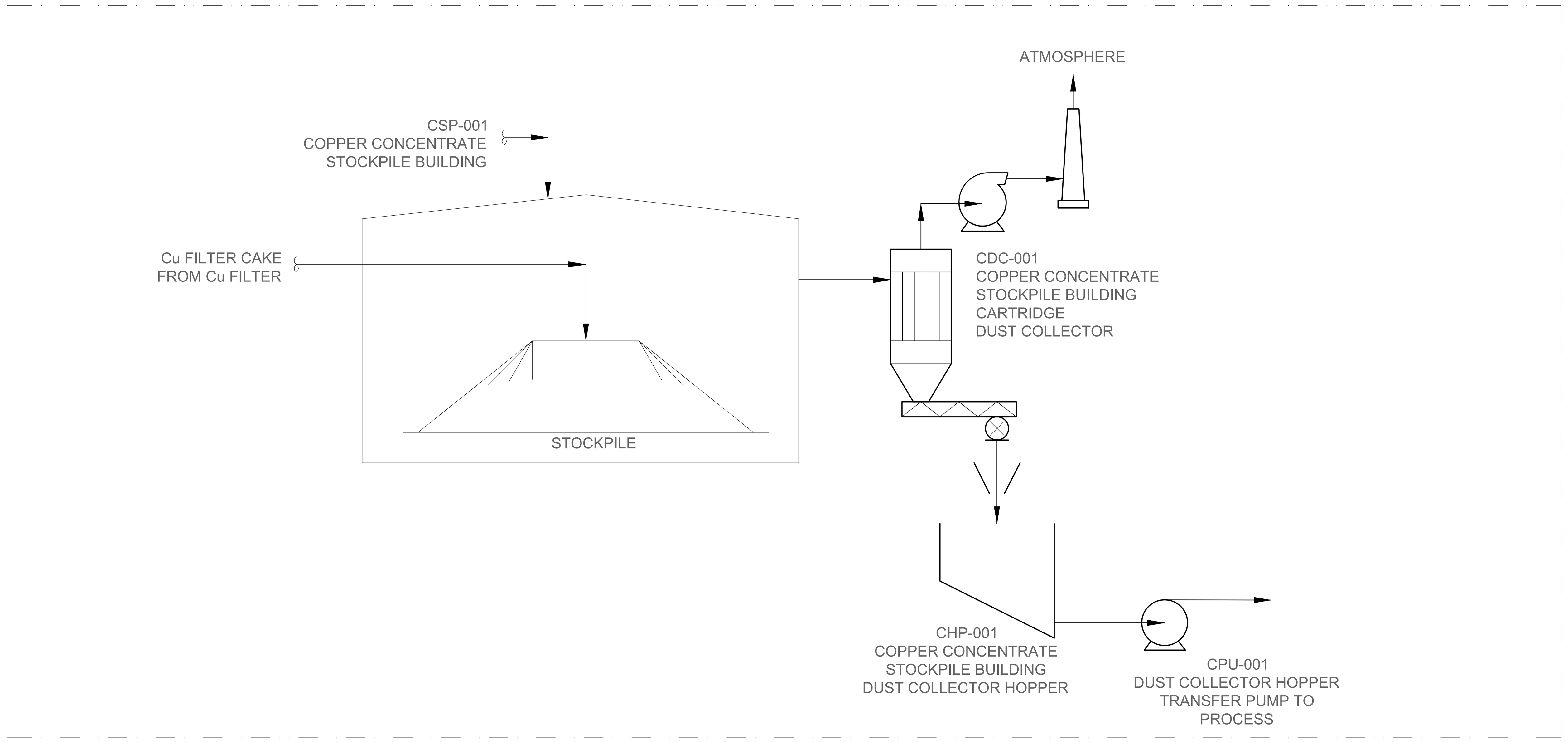
COPPER WORLD PROJECT

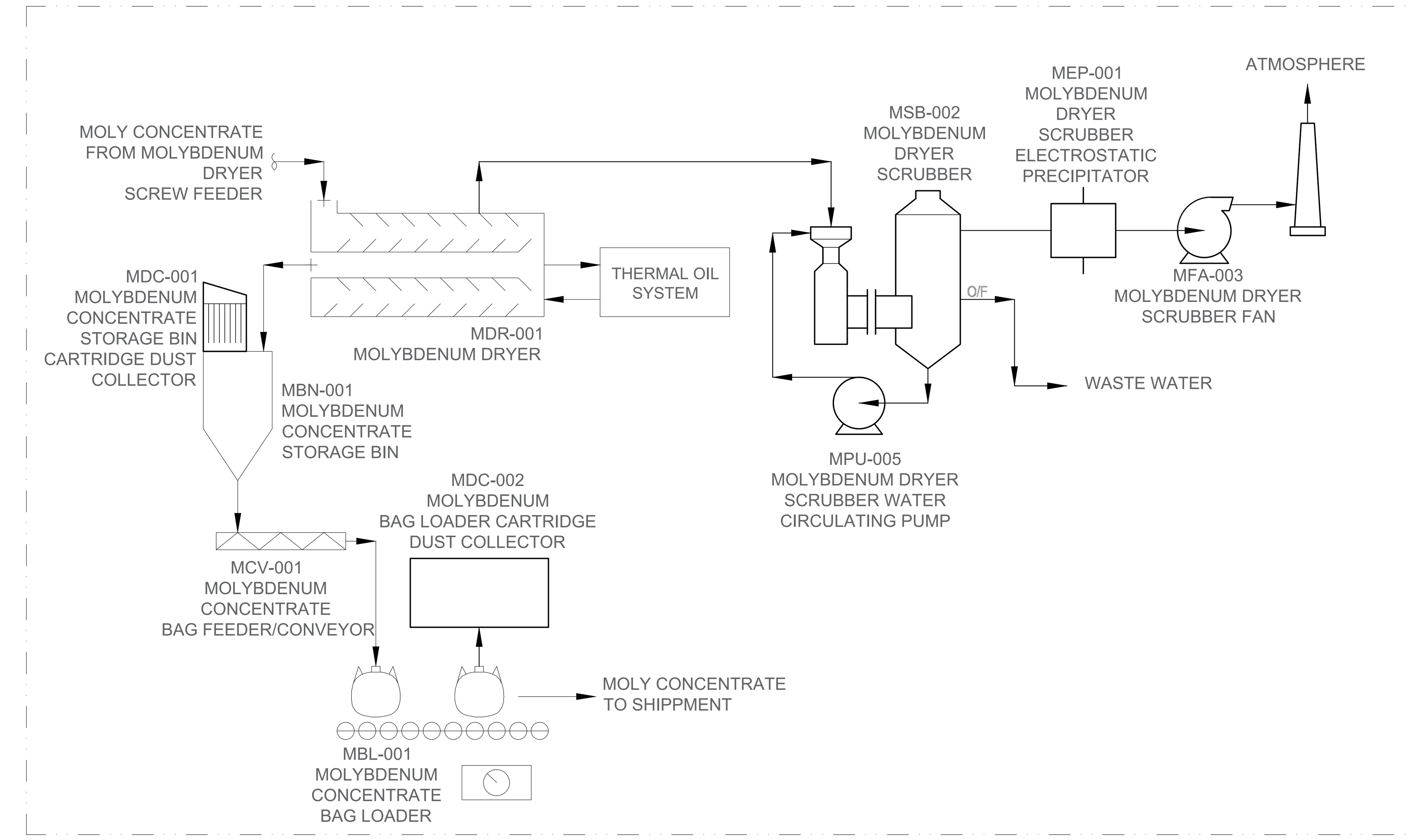
PROCESS PLANT
PROCESS FLOW DIAGRAM
EMISSION POINTS
SHEET 2 OF 7

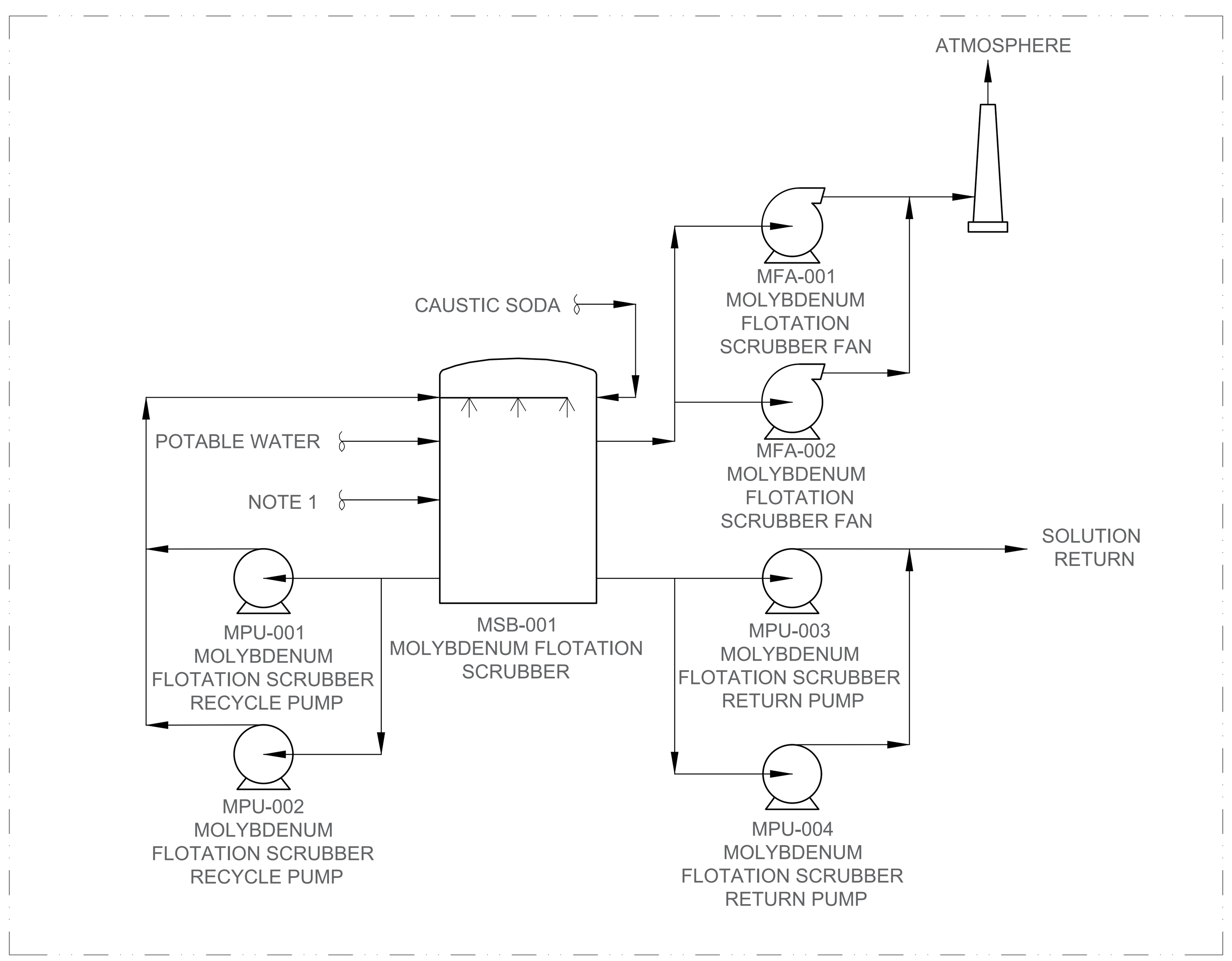
CONTRACTOR DWG. NO.

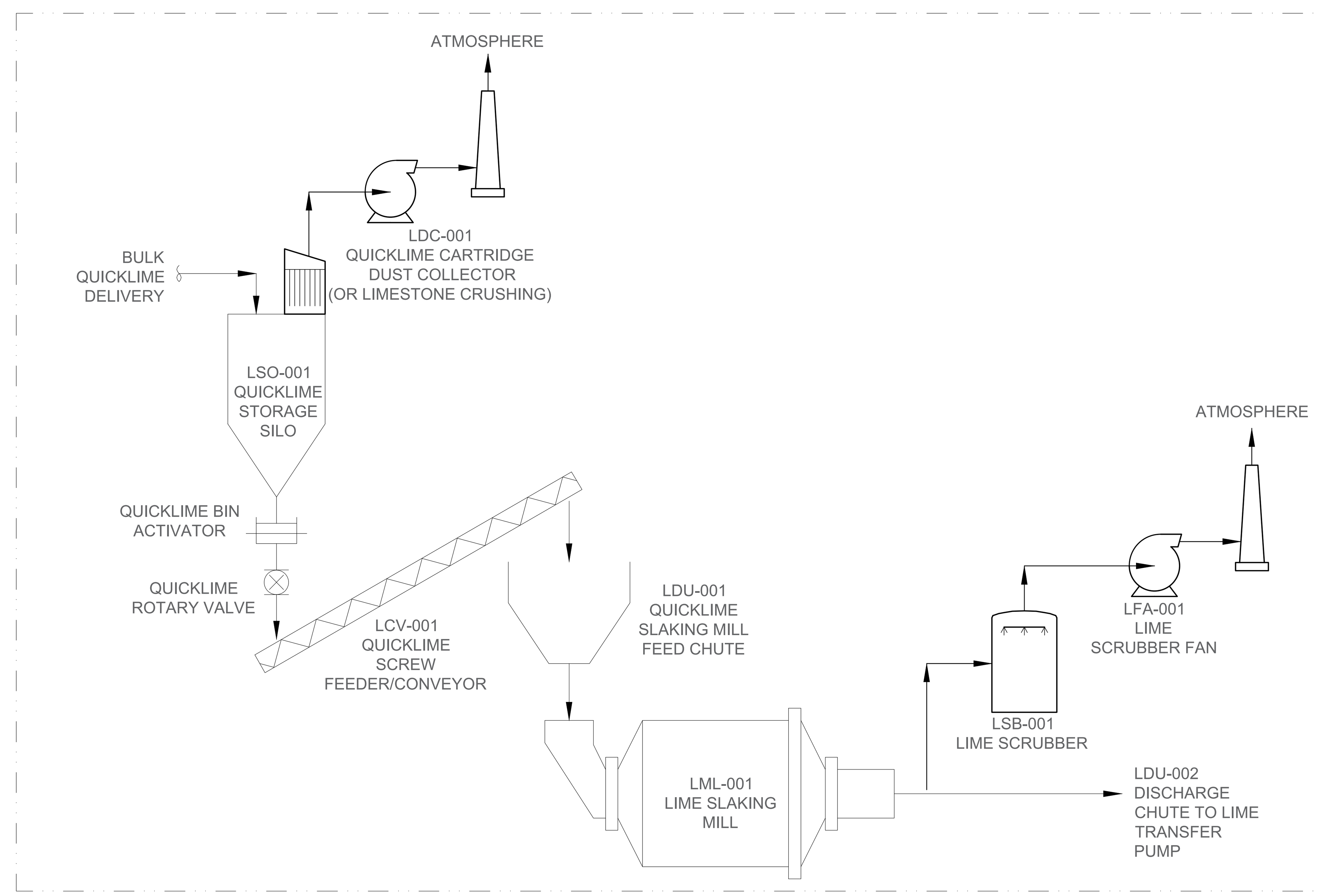
DWG. NO. 300-V-020

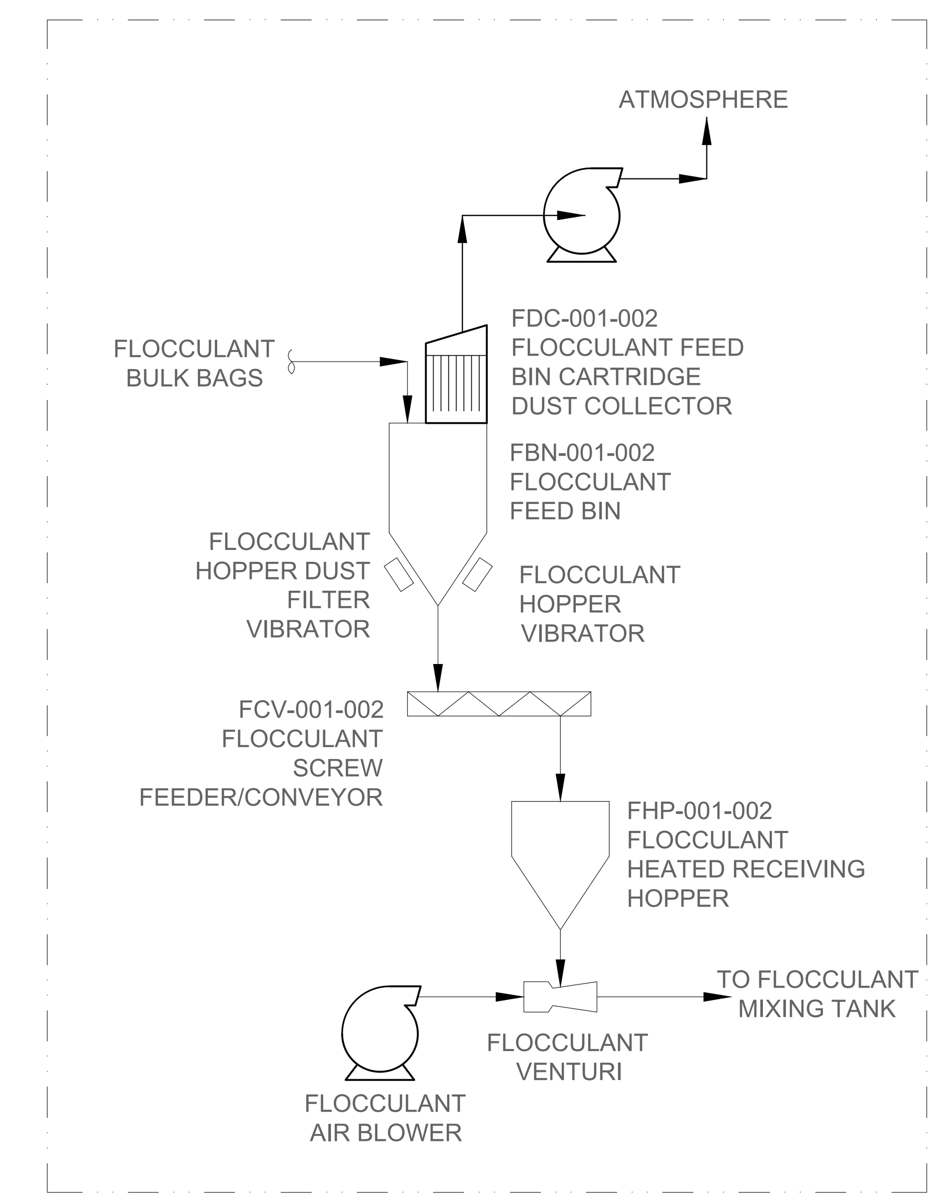
REVISION 0 DATE 24APR23











NOTE:

1. SCRUBBER CONNECTED TO PRESSURE EQUALIZATION LINES OF FLOTATION CELL, CYCLONES, HOPPERS, CONDITIONING & NaSH STORAGE TANKS.

LEGEND:

DUST EXTRACTION SYSTEM
MAIN PROCESS

ANSI D

REFERENCES		REFERENCES		REVISIONS							REVISIONS						
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COPPER WORLD PROJECT

PROCESS PLANT
PROCESS FLOW DIAGRAM
EMISSION POINTS
SHEET 3 OF 7

CONTRACTOR DWG. NO.

DWG. NO. 300-V-030

REVISION 0 DATE 24APR23

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COPPER WORLD PROJECT

PROCESS PLANT
PROCESS FLOW DIAGRAM
EMISSION POINTS
SHEET 4 OF 7

CONTRACTOR DWG. NO.	
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REVISION	DATE
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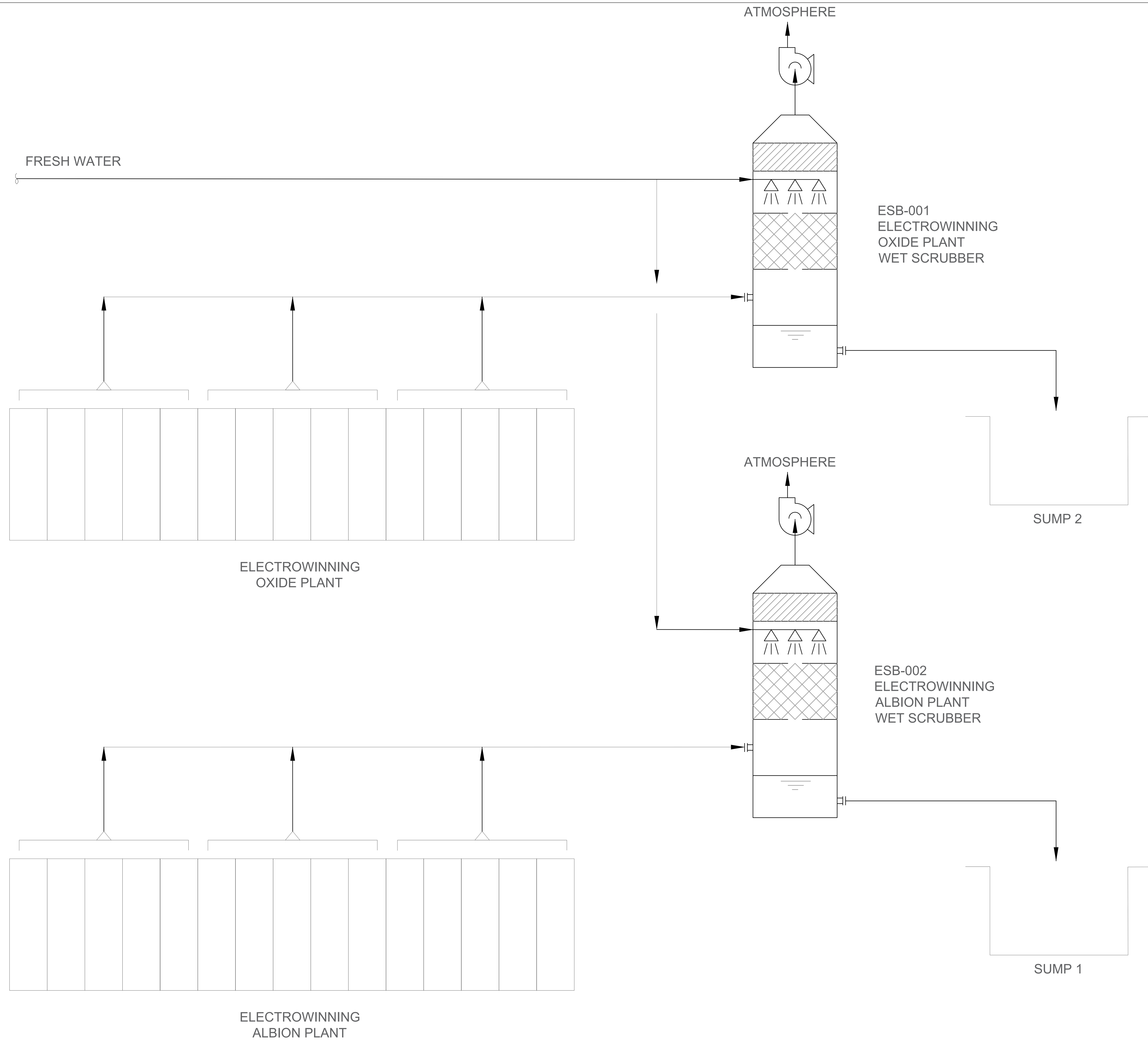

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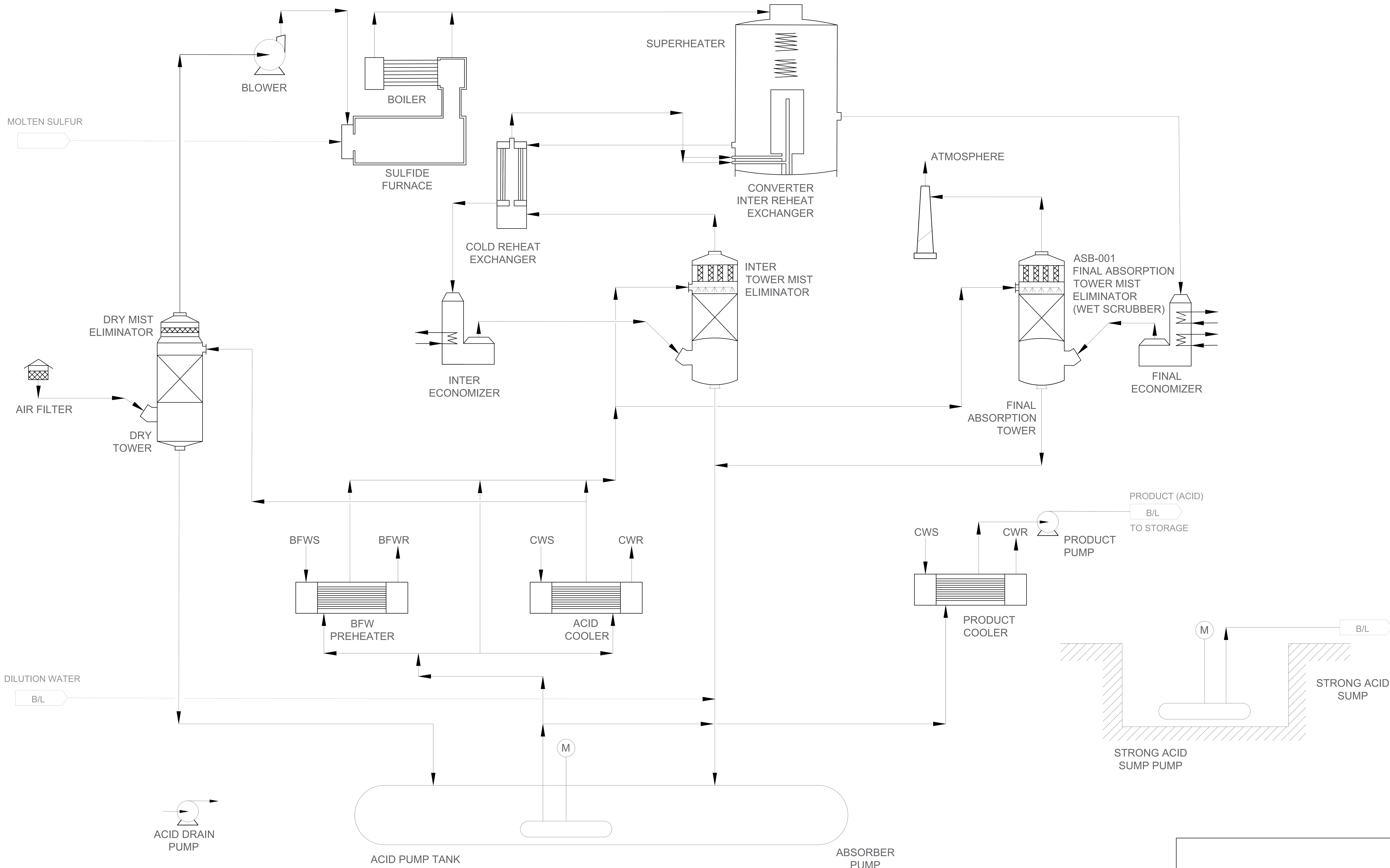
COPPER WORLD PROJECT

PROCESS PLANT
PROCESS FLOW DIAGRAM
EMISSION POINTS
SHEET 5 OF 7

CONTRACTOR DWG. NO.

DWG. NO. 300-V-050

REVISION 0 | DATE 24APR23



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COPPER WORLD PROJECT

PROCESS PLANT
PROCESS FLOW DIAGRAM
EMISSION POINTS
SHEET 6 OF 7

CONTRACTOR DWG. NO.

DWG. NO. 300-V-060

REVISION 0 DATE 24APR23

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HUDBAY

COPPER WORLD PROJECT

PRECIOUS METALS CIRCUIT
PROCESS FLOW DIAGRAM
EMISSION POINTS
SHEET 7 OF 7

CONTRACTOR DWG. NO.

DWG. NO. 300-V-070

REVISION 0 | DATE 24APR23

APPENDIX F. REVISED EMISSIONS INVENTORY (ELECTRONIC)